kilobaud

# MICROCOMPUTING

# Will Fate Shortchange Your Family's Future?

Computerize Your Estate Planning. Pg.31

PROBATE

INHERITANCE TAXES DEBTS

YOUR

IN IERI INCE

Picture-pertect SWTP program Z-80 upgrade for the HELIPET Mini Monitor unveiled Reining in Apple video Subscription-handling with the OS-Calling your computer by phone CP/M hard-copy secrets unlocked Apply pill for Microsoft BASIC New NSC800 Land more



### A Few Extraordinary Products for Your 6800/6809 Computer

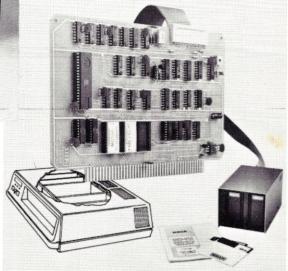
SS-50 Bus LFD-400™ and LFD-800™ Systems

From Percom . . .

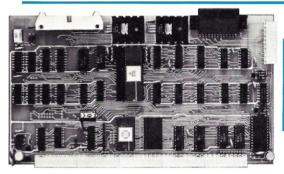
Low Cost Mini-Disk Storage in the Size You Want 14

Percom mini-disk systems start as low as \$599.95, ready to plug in and run. You can't get better quality or a broader selection of disk software from any other microcomputer disk system manufacturer — at any price!

Features: 1-, 2- and 3-drive systems in 40- and 77-track versions store 102K- to 591K-bytes of random access data on-line · controllers include explicit clock/data separation circuit, motor inactivity time-out circuit, buffered control lines and other mature design concepts • ROM DOS included with SS-50 bus ver-- optional DOSs for EXORciser\* bus • extra PROM sockets on-board • EXORciser\* bus version has 1K-byte RAM • supported by extended disk operating systems; assemblers and other program development/debugging aids; BASIC, FORTRAN, Pascal and SPL/M languages; and, business application programs.



EXORciser\* Bus LFD-400EX™ -800EX™ Systems



### The SBC/9™. A "10" By Any Measure. ∠13

The Percom SBC/9™ is an SS-50 bus compatible, standalone Single-Board Computer. Configured for the 6809 microprocessor, the SBC/9™ also accommodates a 6802 without any modification. You can have state-of-the-art capability of the '09. Or put to work the enormous selection of 6800-coded programs that run on the '02.

The SBC/9™ includes PSYMON™, an easily extended 1-Kbyte ROM OS. Other features include:

- Total compatibility with the SS-50 bus. Requires no changes to the motherboard, memory or I/O.
- · Serial port includes bit-rate generator. RS-232-C compatible with optional subminiature 'D' connector installed. 10-pin Molex connector provided.
- Eight-bit, non-latched, bidirectional parallel port is multi-address extension of system bus. Spans a 30-address field; accommodates an exceptional variety of peripheral devices. Connector is optional.
- Includes 1-Kbyte of static RAM.
- Costs only \$199.95 with PSYMON™ and comprehensive users manual that includes source listing of PSYMON™.

<sup>™</sup> trademark of Percom Data Company, Inc.
\* trademark of the Motorola Corporation.

Prices and specifications subject to change without notice.

### Versatile Mother Board, Full-Feature Prototyping Boards ∠15

Printed wiring is easily soldered tin-lead plugged into an SS-50 bus. Features plating. Substrates aré glass-epoxy. Prototyping cards provide for power regulators and distributed capacitor bypassing, accommodate 14-, 16-, 24- and 40-pin DIP sockets. Prototyping boards include bus connectors, other connectors and sockets are optional.

SS-50 bus cards, and may itself be connector on top edge. Price: \$14.95.

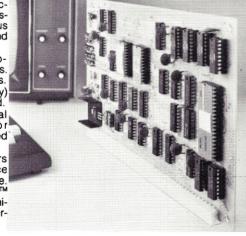
wide-trace conductors. Price: \$21.95 SS-50 BUS CARD - accommodates 34and 50-pin ribbon connectors on top edge, 10-pin Molex connector on side edge. Price: \$24.95.

SS-30 BUS CARD - 11/4-inch higher than SWTP I/O card, accommodates 34-MOTHERBOARD — accommodates five pin ribbon connector and 12-pin Molex

### The Electric Window™: Instant, Real-Time Video Display Control ∠16

Memory residency and outstanding software control of display format and characters make this SS-50 bus VDC card an exceptional value at only \$249.95. Other features:

- Generates 128 characters including all ASCII displayable characters plus selected Greek letters and other special symbols.
- · Well-formed, easy-toread 7x12-dot characters. True baseline descenders.
- Character-store (display) memory included on card.
- Provision for optional character generator EPROM for user defined symbols.
- Comprehensive users manual includes source listing of Driver software. Driver — called WINDEX™ is also available on minidiskette through the Percom Users Group.





PERCOM DATA COMPANY, INC. 211 N. KIRBY GARLAND, TEXAS 75042 (214) 272-3421

Products are available at Percom dealers nationwide. Call toll-free, 1-800-527-1592, for the address of your nearest dealer, or to order direct.

In late 1978, Intertec conceived the idea of the InterTube Video Display Terminal. Since that time, we've greatly enhanced its operation with the addition of many new exciting features. But perhaps the most significant announcement in the InterTube line of video terminals is our new InterTube III.

The new \$895\* InterTube III obsoletes dumb terminals and out-performs the smart ones. Powerful standard features include: a full 24 line by 80 character display, 128 upper and lower case ASCII characters, reverse video, complete cursor addressing and control, an 18 key numeric pad, user-defined function keys, blinking, a self-test mode, protected and unprotected fields, below-the-line descenders, automatic key repeat, twin RS232 serial ports and character and line insert/delete. Incredible!

InterTube III also boasts newly designed processor, video and power supply circuits. All in all, the InterTube III is what we believe to be the most powerful, reliable video terminal available today. And it costs less than its predecessor - our popular InterTube II.

InterTube III users will appreciate the many painstaking hours of human engineering which insure effortless operation without operator fatigue. InterTube III's new high resolution, non-glare CRT provides the sharpest possible display image. And our newly designed keyboard has that expensive "feel" you normally find only on terminals costing two to three times as much. But, most importantly, the InterTube III features state-of-the art design with just three easily removable modules. So, with only a common screwdriver, servicing is a snap!

Better yet, we've got a nationwide service network with outlets located in over 50 cities to provide fast and efficient on-site or depot maintenance. Plus, an extended warranty program is also available.

If you're an existing InterTube user, you no doubt have discovered the exceptional value the InterTube really is. And, if you're not, why not call or write us today for the name and address of your nearest InterTube III dealer. Intertec video terminals are distributed worldwide and may be available in your area now.



2300 Broad River Rd, Columbia, SC 29210 (803) 798-9100 TWX: 810-666-2115



### Digital IC Probe & Logic Pulser

PRB-1 DIGITAL LOGIC PROBE

Compatible with DTL, TTL CMOS, MOS and Microprocessors using a 4 to 15V power supply. Thresholds automatically programmed. Automatic resetting memory. No adjustment required. Visual indication of logic levels, using LED's to show high, low, bad level or open circuit logic and pulses. Highly sophisticated, shirt pocket portable (protective tip cap and removable coil cord).

Automatic threshold resetting • DE to > 50 MHZ

Compatible with all logic families 4-15 VDC • 10 Nsec. pulse response

Supply O.V.P. to ± 70 VDC • 120 K Ω impedance

No switches/no calibration • Automatic pulse stretching to 50 Msec.

Open circuit detection • Automatic resetting memory

Range extended to 15-25 VDC with optional PA-1 adapter PLS-1 LOGIC PULSER

The PLS-1 logic pulser will superimpose a dynamic pulse train (20 pps) or a single pulse onto the circuit node under test. There is no need to unsolder pins or cut printed-circuit traces even when these nodes are being clamped by digital

PLS-1 is a multi-mode, high current pulse generator packaged in a hand-held shirt pocket portable instrument. It can source or sink sufficient current to force saturated output transistors in digital circuits into the opposite logic state. Signal injection is by means of a pushbutton switch near the probe tip. When the button is depressed, a single high-going or low-going pulse of  $2\mu$  sec wide is delivered to the circuit node under test. Pulse polarity is automatic: high nodes are pulsed low and low nodes are pulsed high. Holding the button down delivers a series of pulses of 20 pps to the circuit under test.

High input impedance(off state) 1 meg ohm ● Multi mode-single pulses or pulse trains

Low output impedance (active state) 2 ohms • Automatic polarity sensing

Output pulse width 2  $\mu {
m sec}$  nominal ullet Automatic current limiting; 7 amps nominal

Input over voltage protection +50 volts • Automatically programmed output level

Finger tip push button actuated • Circuit powered

Power lead reversal protection • No adjustments required

Multi-family RTL, DTL, TTL, CMOS, MOS and Microprocessors.

PRB 1 DIGITAL LOGIC PROBE HIGH VOLTAGE ADAPTER \$36.95 PA1 PC 1

\$4.95 PT 2 \$9.95 PLS 1 POWER CORD, Alligator Clips REPLACEMENT PROBE TIP(2) \$1.50 POWER CORD, Micro Hooks LOGIC PULSER \$48.95

OK Machine & Tool Corporation >54

3455 Conner St., Bronx, N.Y. 10475 U.S.A. Tel.(212)994-6600 Telex 125091

> \*Minimum billings \$25,00, add shipping charge \$2.00 New York State residents add applicable tax

PC 2

### micro info

This symbol next to a title in the table of contents indicates that the article is a businessapplication article

### **Manuscripts**

Contributions in the form of manuscripts with drawings and/or photographs are welcome and will be considered for possible publication. We can assume no responsibility for loss or damage to any material. Please enclose a self-addressed, stamped envelope with each submission. Payment for the use of any unsolicited material will be made upon acceptance. All contributions should be directed to the Microcomputing editorial offices. "How to Write for Microcomputing" guidelines are available upon request.

### **Editorial Offices:**

Pine Street Peterborough NH 03458 Phone: 603-924-3873

### Advertising Offices:

Elm Street Peterborough NH 03458 Phone: 603-924-7138

### Circulation Offices:

Flm Street Peterborough NH 03458 Phone: 603-924-7296

### To subscribe, renew or change an address:

Write to Microcomputing, Subscription Department, PO Box 997, Farmingdale NY 11737. For renewals and changes of address, include the address label from your most recent issue of Microcomputing. For gift subscriptions, include your name and address as well as those of gift recipients. Postmaster: Send form #3579 to Microcomputing, Subscription Services, PO Box 997, Farmingdale NY

### Subscription problem or question:

Write to Microcomputing, Subscription Department, PO Box 997, Farmingdale NY 11737. Please include an address label.

Kilobaud Microcomputing (ISSN 0192-4575) is published monthly by Wayne Green, Inc., 80 Pine St., Peterborough NH 03458. Subscription rates in U.S. are \$25 for one year and \$53 for three years. In Canada: \$27 for one year only, U.S. funds. Foreign subscriptions (surface mail) - \$35 for one year only, U.S. funds, Foreign air mail subscriptions - \$62 for one year only, U.S. funds. In Europe, contact: Monika Nedela, Markstr. 3, D-7778 Markdorf, W. Germany. South African Distributor: KB Microcomputing, PO Box 782815, Sandton, South Africa 2146. Australian Distributor: Electronic Concepts, Attention: Rudi Hoess, 55 Clarence Street, Sidney 2000, Australia. Second-class postage paid at Peterborough NH 03458 and at additional mailing offices. Phone: 603-924-3873. Entire contents copyright 1980 by Wayne Green, Inc. No part of this publication may be reprinted or otherwise reproduced without written permission from the publisher.

### kilobaud

### MICROCOMPUTING\*\*\* contents: October '80

### ARTICLES

- Computerized Estate Planning OSI program to settle your wealth. James Owens 31
- \$ Conversing with Your Computer Call your computer by phone. Marc Seligman
- 40 Address List Program Machine-language program for 6800 users. C. H. Looney
- Upgrading the Heath H8 with a Z-80 The HZ8 adapter. Patrick Swayne
- 56 Level II ROM Subroutine Test Talking to your TRS-80. Robert M. Richardson
- Kilobaud Klassroom No. 21 Expansions and Programming. Peter A. Stark
- 72 What Is the Utility of a Utility? Information at low cost. Frank J. Derfler, Jr.
- 75 Darkroom Computerist A picture-perfect way to use your SWTP. Marc I. Leavey, M.D.
- Start/Exit Routine for CP/M Orderly linkages between CP/M and user programs. Ken Barbier 82
- Modifying the Horizon Double Density DOS Personalize your system. George L. Haller 84
- 88 PET Mini Monitor Saving machine-language programs is a snap. William H. Perdue
- 92 Computer-Controlled Triac Dimmer A light project. Merrill Lessley
- 102 S OSI in the Sky A heavenly approach to handle subscriptions. William E. Shawcross, Roger W. Sinnott
- 106 A New Branch on the Family Tree The NSC800. Ken Barbier
- 112 Area Estimation It's a matter of BASIC geometry. Arnold W. Bragg
- 117 The SWTP Computer System Topics include the 6809, multiprogramming and interrupts. Peter A. Stark
- 128 Speed Up Your BASIC Programs Simple techniques make a difference. Edward H. Carlson
- 132 Whoa, Apple Tightening the reins on galloping video displays. Terry Edward Phillips
- 136 Cassette Format for 6800 Systems Speed improvement for the KC Standard. Dr. Gordon W. Wolfe
- 142 Exploring CT-82 Graphics SWTP video terminal revealed. Phil Hughes
- Tracking Down the Bus Why some boards won't work with the S-100. Richard A. Rodman 154
- Dial-up Directory Meet Forum-80 founder, Bill Abney. Frank J. Derfler, Jr. 158
- 162 Reduce Search Time with an Index Breeze through file searches. LeRoy E. Kolderup
- Video HARDCOPY for CP/M Instant printing power. Glenn Stok 168
- 174 Bridging the 1 pF to 100,000 uF Gap Inexpensive digital capacitance meter. Robert J. Stetson
- Betting on Old POKEy Animated graphics on your PET. Gary Greenberg 180
- 182 The 16-Bit Time Trials Benchmarks revisited. Allan Flippin
- 192 1802 Machine-Language Techniques Puts zip in your VIP. Gerald Strope
- 196 Poor Man's Logic Analyzer Troubleshooting on a shoestring. Scott B. Eckert
- 202 A Humanist's Approach to Computer Programming A man is his program. Dick Lutz
- 208 Overlay Programming Memory-saving technique. Robert A. Peck
- A Roundoff Function in Applesoft Keep your numbers manageable. Barton M. Bauers, Jr.
- Clock Control Board Speed up your TRS-80...elegantly. Mark A. Schimelman, M.D.

### **DEPARTMENTS**

Publisher's Remarks - 6

PET-pourri - 12

Computer Blackboard - 16

Book Reviews - 18 Micro Quiz - 19

New Products - 20

New Software - 23

Letters to the Editor - 27

Dealer Directory - 214

Classifieds - 214

Cover photo by Reese Fowler.

### DUBLISHER'S REMARKS

### Five Years Ago, Five Years Hence

The microcomputer industry is just five years old this year, yet it has already seen some spectacular changes—and more are to come. In 1975 Mits introduced the first microcomputer kit to attract widespread attention. Before that, several small firms had kits using the 8008 chip, but the interested numbered in the hundreds rather than the thousands. It took Mits to break things loose.

By the end of that first year, Mits had been joined by Sphere and Southwest Technical Products, both using 6800-based systems. And by this time I had already put out four issues of *Byte*, the first magazine for the industry.

During 1976 the field expanded, with systems from Imsai, Processor Tech, Polymorphics, Wavemate, The Digital Group, OSI, Intelligent Systems, M&R (Astral 2000), Apple, ECD, TDL, Veras Systems, etc.

Of the 1975 firms, only SWTP is still around, though I have seen few of their systems in stores or ads in a long time, and interest in software for their system seems to have disappeared. Apple has outperformed the 1976 group, with OSI continuing to grow. The rest have either disappeared or virtually disappeared.

In 1977 we had more successful starts, with Commodore, along with Heath, coming in early, followed by Radio Shack in mid-year. Commodore threw away their lead and hundreds of millions of dollars in sales by refusing to back up their system with advertising and an aggressive technical team. Heath tried to make a go of it with only their 50 company-owned stores. This, plus their refusal to go with the S-100 bus, in my estimation, cost them tens of millions of dollars in sales.

Radio Shack had a tough row to hoe at first. Their store managers not only knew nothing about computers, but most of them had little understanding of audio or CB, so they were afraid of this new invention and completely unequipped to cope with customers asking questions about ROMs and RAMs. They did have several things going for them—a superb instruction book, written by David Lien, and massive television and newspaper advertising. They also benefited from the almost total consumer invisibility of Commodore and Heath.

Approaching 1981, we're looking into our crystal ball to see what the microcomputer business will look like in five more years. It's almost impossible to look with any clarity into the middle of next year, much less five years down the pike. There are too many variables. If we assume that there are not going to be any more quantum developments, such as the 8080 chip, perhaps we can gain enough perspective to fig-

ure out where we can take advantage of what is happening for our own benefit.

The first order of business in predicting the future is to start with the market, presuming that the industry will pursue the market, rather than the reverse. The first computerists were hobbyists. They had to be, because making a computer from a kit, with pathetic instructions and with a finished product that often had not even worked in prototype, took considerable skill to have any success. The early manufacturers worked on the principle that hobbyists would build the kits and figure out how to make them work, thus performing the last ten percent of the engineering for them. It turned out that this system worked just fine, though it severely frustrated several thousand hobbyists in the process.

As the field matured, the early hobbyists either got fed up with the expense and bum equipment and dropped out, or became dealers or manufacturers in the business. Many of them are still around, taking advantage of the things they learned during the first two years of microcomputers.

With the advent of complete systems sales, the electronic-type hobbyist decreased in importance and was replaced by a new type of hobbyist, one interested in *using* the computer rather than building it. These new hobbyists quickly became deeply involved in developing utilities, writing programs, developing games and generally finding out the capabilities of their systems and expanding them.

There is still a good market for teenagers interested in learning about computers. I think this will continue, but I would expect it to be a relatively limited market as compared to business and educational applications. There may be a few hundred thousand kids with \$1000 to spend on a hobby, but are there much more than that? We'll see.

The businessman sees the computer as a way to save money and to get more done in less time. But he is still wary of microcomputers...and he should be. I am still awaiting articles written by businessmen who have invested in microcomputer systems and found them to be of distinct advantage to them. Most of the letters I receive are to the contrary, expressing frustration over delivery problems, over service miseries and over the state of the software available. I'll be more convinced that the industry has an honest bargain for business when I start getting articles by the dozens lauding systems and programs they are using.

Once we have systems that can actually be used by business to save money and time, I think they will sell in prodigious quantities. Once we have systems that are clearly of value to schools, I think we'll be selling millions of microcomputers.

Where do we stand with suppliers? Radio

Shack is out in front selling about three times as many systems as Apple, the next firm in line. That's my guess. I've visited the Radio Shack production facility and seen what they are doing. Apple has not offered to let me see theirs, so I don't know what they are doing for sure. But the sales figures that I have seen and the polls of our readers indicate about a three to one advantage for Radio Shack at present. The new Apple III may make the Apple of more interest for business applications, if they are somehow able to come up with some software support. In my discussions with Apple, I have not been convinced that they are serious about software—but then, neither is Radio Shack.

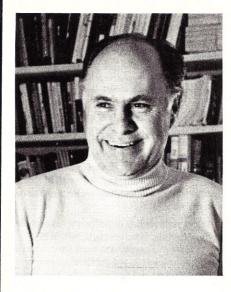
Commodore has new management and is starting to try to make up for lost time. They, too, have some new systems to try and keep up with the state of the art. It's quite a race, with Radio Shack fielding three new systems in July and one more promised for November, bringing their coverage up to six current models.

Other firms, such as Atari, Mattel and Bally, are all substantial firms, but none of them have shown any interest in more than minimal software for their systems, so I will be surprised if they do not waste a few million dollars before dropping out. They are mainly building extravagant toys to play games. I can't believe that this is a viable long-term market. I think that these firms are so involved with games that they got taken in by the term "personal computer" and think that there really is a market for personal toy computer systems. Computer games will always be popular on computers, but I don't think that many people (thousands maybe, but hundreds of thousands?) are going to spend \$1000 to \$2000 for a computer dedicated to games.

So we have several firms with good possibilities for growth over the next few years. But we also have a number of firms that seem to be heading in the wrong direction, and none that I have seen so far have any serious interest in bettering their sales potential with the needed software. I predict that one of the major firms will suddenly discover the importance of software and will quickly pass by all the others when they put this discovery to use. Until that happens, I see a battle taking place for a relatively small market for microcomputers. I don't think the market will increase until there is a large number of programs to support the systems.

### The Detroit Syndrome

The Japanese are getting ready to pounce, and I suspect that their marketing plan is going



to be a lot more clever than those we have seen from many of the American firms. The equipment won't be much better, but their advertising and marketing will be. Are they serious about this? Matsushita, which markets here under the Panasonic and Quasar names, is serious, and they think they are going to sell over one million computers in 1981 in the U.S. That's a lot more than Radio Shack, Apple and all the rest are figuring to sell.

Casio is thinking big, and with good reason. They have done a fantastic job of taking over a large share of the calculator market in the last three years. I carry at least three Casio calculators, plus a Sharp Talking Clock, around with me most of the time. I think Sharp will be here soon with a computer, too. They are going hot and heavy in Europe expanding their production to where they can be very competitive. Casio says they intend to be the biggest firm in the business here in two years.

As more and more Japanese firms dig their toes in at the starting line for the race across America, I'm watching to see what our American firms will do to counter this invasion. So far this year we've seen entries from Quasar, Panasonic and Casio, as well as from NEC, with Sharp and Hitachi headed this way. A reading of our trade literature makes it apparent that these firms are very serious about taking over and making microcomputers as much of a Japanese preserve as are small cars, stereo systems, television sets, CB radios, amateur radios and most of the other high-technology big-bucks consumer industries.

Surely our American microcomputer firms are aware of what is happening and are preparing for the battle? This is not the case. In fact, as I visit the American firms, I see a nevernever-land blindness to what is going on. Wishful thinking and a euphoria resulting from success have virtually wiped out reality.

How can you expect people who are making fabulous salaries, working in lavish offices in multi-building complexes-all generated in the last year or two-surrounded by minions anxious to please and fearful of sounding a disturbing tone to have any perspective? Most of these unfortunates have built up a dreamworld around themselves and their accomplices. It was in such a world that Processor Tech selfdestructed. This same protective buffer of unreality helped Imsai to disintegrate. You can be sure that not one of the new tycoons will have the time to read this, much less think seriously about it.

Thus, I see our American industry as being very fragile, built on ever-increasing growth, but virtually blind to what is going on outside of the beautiful executive suites in Silicon Valley as viewed through their tinted picture windows facing on automatically watered grass lawns. I see this as a scenario for disaster as the hard-working and advertising-wise Japanese start moving in.

At first, our industry will try to refuse to acknowledge that the Japanese really exist or are any serious threat. By the time they do begin to see what is happening, it will be too late, and they will be scrambling to see what, if anything, can be salvaged from the ruin. We'll see more of the midnight back-door deals as the formerly anointed back up rented trucks to grab as much as they can from assembly lines before the sheriff puts on the locks.

In addition to this number-one blindness, which I expect the Japanese to exploit, there is one other serious, and perhaps even terminal, weakness in the American microcomputer industry. This is the same weakness that has helped wipe out our car industry—pay scales.

Yes, I know all about the unresponsiveness of the Detroit moguls to the desire for small cars. But while it is unpopular to give the businessmen of Detroit credit for having any brains, the fact is that these gentlemen were well aware of the American need for economy cars. But Detroit had a problem, an insoluble problem: They could not compete against Germany and Japan in building small cars because the American auto workers were getting double the average American wage, while the foreign workers were making about the same wages as Americans.

If Detroit could have started over and been able to pay normal American wages, I would not be driving an RX-7 Mazda and a Datsun 280Z, nor would I be considering a Rover 3500 as a new-car purchase. Japan moved in gradually, keeping their costs down by paying normal wages to their people, keeping executive overhead low and automating in every way possible. I'm sure that our auto unions will fight for their double the average American wages until the last car company goes down the tubes. We've seen this same mentality sinking England for several years with no relief in sight.

I realized that American productivity has been very low compared to other countries and is dropping further behind, but I hadn't realized how much the wage scales forced on the auto industry by the powerful unions had made the industry unable to compete with foreign auto makers, thus forcing the American firms to keep making the larger gas guzzlers, which foreign firms were not. Our firms made the only product they could sell and then backed this up with their massive advertising system. Now that is all falling apart.

How does this apply to the computer industry? We have the same pattern for the Japanese to exploit-excessive salaries, particularly in Silicon Valley, where these astounding figures are almost considered normal, an incredible

### MICROCOMPUTING T.M.

PUBLISHER/EDITOR Wayne Green

ASSISTANT PUBLISHER/EDITOR Jeff DeTray

> ASSOCIATE PUBLISHER Edward Ferman

MANAGING EDITOR Dennis Brisson

ASST. MANAGING EDITOR

Susan Gross

COPY EDITOR Eric Maloney

ADMINISTRATIVE ASSISTANTS

Suzy Clyne Nancy Noyd

ASSOCIATE EDITORS

Robert Baker Ken Barbier Frank Derfler, Jr. Rod Hallen Peter Stark Sherm Wantz

DIRECTOR OF MANUFACTURING

Noel Self

ASST. DIRECTOR OF MANUFACTURING

Dion Owens

ART DIRECTOR

Diana Shonk

PRODUCTION DEPARTMENT ART STAFF

William Anderson, Jr. Steve Baldwin Tedd Cluff Linda Drew Robert Drew Bruce Hedin Kenneth Jackson Ross Kenyon Clare McCarthy Michael Murphy Robert Sawyer Patrice Scribner Susan Symonds John White

**PHOTOGRAPHY** 

William Heydolph Terrie Anderson Reese Fowler

**TYPESETTING** 

Barbara Latti Sara Bedell Linda Locke

**EXECUTIVE VICE PRESIDENT** Sherry Smythe

CORPORATE CONTROLLER Alan Thulander

**EXECUTIVE ASSISTANT** Leatrice O'Neil

ACCOUNTING MANAGER Knud Keller

CIRCULATION MANAGER

Debra Boudrieau

CIRCULATION Barbara Block

Pauline Johnstone **BULK SALES MANAGER** Ginnie Boudrieau

> ADVERTISING 603-924-7138

Kevin Rushalko, Mgr. Marcia Stone Hal Stephens

lack of automation in the factories and tremendous overhead caused by armies of managers and executives. These excesses, made possible by the 300-400 percent growth per year of the industry, are the seeds of its destruction. The Japanese run a lean and mean ship, so they can come in and stomp us with prices we can't

All those executives and opulence add substantially to the cost of our computers, adding far more than the small import duties and shipping costs from Japan. I predict that unless our major firms get out of Silicon Valley and into the low-rent districts and pay average American wages to the few people needed in much more automated factories, we'll see 90 percent of the microcomputers coming from Japan within five years.

Japan took over the ham equipment, stereo, watch, calculator and radio markets. Now we are seeing technology coming from Japan, instead of from the U.S.

Despite this foreign influx, life goes on happily in Silicon Valley, with not even a ripple of concern or reaction from our industry. Radio Shack is in a lower-rent district, but they need to pay attention to their corporate overhead and lack of automation in their plants. They also need some fast work on software support of their products and advertising approach. They do have the stores and a two-year head start, so it would be a shame to see them blow it now.

Japan already has some advantages over us by virtue of their lower-cost memory and microprocessor chips. They pulled this off by outautomating our chip firms, thus cutting down the labor costs involved in making the chips. They also have a substantial advantage over us in employee efficiency, oddly enough, using American know-how. You may have read some of the spate of recent articles on how the Japanese brought an American named Demming over to Japan and applied his ideas on a national scale to improve their productivity and attention to quality control.

The Japanese have well-developed Quality Circles to attack every hint of a defect in the quality of their products or service. They worry about how many hours it takes for a computer to be fixed for the customer, the quality of the package it is sold in, the advertising and the brochures. Every detail of business is relentlessly pursued for quality, and the result is superb products, superb advertising and customer enthusiasm and confidence. I know when I buy a Casio or Sony product that it is going to be first class in every way and that I am not ever going to have hassles. I wish I could say the same for some of the American firms; my files are filling with bitter customer complaints about their quality and disregard of the customer.

It remains to be seen whether the microcomputer industry can learn from the Detroit debacle and cut their corporate overhead, automate and set up quality control for all phases of their business before it is too late.

Yes, I am painting a grim picture, but my facts are accurate and not exaggerated. I have visited Apple, Atari, Commodore, Radio Shack, Southwest Tech, Texas Instruments, Ohio Scientific, Polymorphics, The Digital Group, Wavemate, Imsai, Sphere, Mits, Astral, ECD, HP and others that don't come immediately to mind. I don't think anyone else is as intimately familiar with our industry. I've been around right from the beginning, talking with the top people in their plants and at shows.

### **UK Report**

A letter from A. Zgorelec of Britain's Personal Computer World magazine, by far the largest of the UK microcomputing magazines with over 100 pages of paid advertising, mentioned that a recent survey estimated that there are about 60,000 microcomputers in that country. About half of those are PET systems, followed by Apple in second place, Nascom (a British computer, now in receivership) in third place and Tandy (Radio Shack) in fourth, with about 8000 systems sold. Tandy has only about 100 stores in UK, as opposed to over 400 stores selling the PET. PET software is far more available and in better quantity and quality.

I suspect that a quick infusion of Instant Software might turn things around for Tandy in UK, but obviously I'm prejudiced. This would call for a change in company policy, something that takes more than the loss of a few million dollars to bring about. 80-Microcomputing is well thought of by the Tandy managers, but they are not allowed to recommend the magazine to customers.

Clive Sinclair and his \$200 single-board Z-80 computer are doing very well, with sales of over 8000 units in eight months and at least a 90-day back-order situation currently. He's making it happen with full-page color ads in the leading Sunday newspapers. This system was shown at CES in Chicago in June, and the signs are that they will be getting going in a serious way in the U.S.

Other manufacturers of microcomputers in UK are Transam, with their Tritan and Tuscan systems, and Acorn Computer, with their Atom and Research machines (strong in the educational field).

### Do Your Homework

It has come to my attention that a rather large number of you readers have been goofing off, not holding up your end of the system. I will not tolerate laziness in a subscriber. When you sign up for Microcomputing, you are doing far more than sending in your crummy \$25. You are also expected to do your share of the

For instance, as part of your responsibility, you are expected to check out the new books being offered by other publishers (we'll take care of reviewing ours) and write brief reviews, pulling no punches about how good or how lousy they are.

This also applies to software. If you purchase a good piece of software, let us know. If you find you've been screwed, level with us. We all will benefit from the news, although Microcomputing may lose an advertiser or two. We even want to know your experiences with Instant Software.

While we are able to check out a lot of the new hardware gadgets in our lab, it is impossible for us to do everything. There's just too much. So when you get a newly released product, please send in a log of your experiences with it so we can pass the information along to the rest of the readers. We want to know how it works, what problems you had and how responsive the manufacturer and dealer were.

You may work out some programming routines which would benefit others. If so, think of Microcomputing as a way to pass along the information. You'll reach the most people that way...by a wide margin. We're all in this together, so the more we help each other, the better off we'll all be.

Send your reports to Software Reports, Microcomputing, Peterborough, NH 03458.

You are also expected to work hard to recruit new subscribers, to put maximum pressure on manufacturers and dealers to advertise, to loyally buy advertised products, keeping your readership of the magazine no secret in the process, to respond enthusiastically to the reader service card each month and do all you can to help support the system of your choice.

If a friend has developed a gadget or worked out a program of interest, get him to write it up for Microcomputing. If you find a computer store that does not have the magazine on display, let us know immediately so we can correct this terrible state of affairs.

Send me newspaper or magazine articles about microcomputers. I don't want to miss anything, but obviously I can't read every publication there is, so I have to count on you.

Okay, now get busy.

### Provide a "HELP" Command

It should not be news to programmers that many of the users of computers are not experts. This should be taken into consideration when programs are written. All programs should provide an explanation of how to use the program by typing HELP.

Many times I find myself faced with a computer program that does not respond to the normal approaches. I really hate that. I don't like to be exposed, even to myself, for the dummy that I can be.

As we get more into business programs, we will have to remember to make them simple to use for someone who has walked up to the computer for the first time. It is not necessary to force experienced people to go through a lot of explanatory stuff every time they want to use the program, but a simple explanation should be available on demand.

Programs submitted for publication and distribution by Instant Software will be trending in this direction. So take note, programmers.

### **Conversions Requested**

What is more frustrating than to turn the page of a new issue of Microcomputing and find just the program you need, only it has been written for use on some other system!

If you are into programming, this will be a hurdle, not a brick wall, and you'll start keying in the code and watching for any commands you know will not perk through your own system. Some systems conversions are more demanding than others, but, in general, there are few programs that will not bend to an iron will. Of course, when it comes to graphics, you're going to have to start pretty much from scratch to generate them with your system. That's where the hard work comes in.

Once you've managed to adapt the program to your system, why be stingy about it? Run off a copy of the new program and send it in to Microcomputing for possible publication (paid) to help others who are up against the problem but don't have the time (or smarts) to surmount it. We'd appreciate a cassette copy, too. If you are running a disk, send it in and we'll get it back to you later. This will enable us to check out your version of the program in our lab and possibly print out a clean listing for publication.

This will help readers with smaller-circulation systems build up their program libraries.

### **Toes Stepped On**

A recent "survey" in one of the newsprint throwaways presented a rather biased report with regard to Instant Software that deserves comment.

The report observed that zero percent of Instant Software is written in-house. This is not quite true. While ISI does not hire programmers to write programs, there are still quite a number of programmers on the staff whose efforts are added to many of the programs and program packages that are released. The object is to make every program as good as it can be and an outstanding value. Thus, the staff often adds routines to programs to enhance them, as do associate editors, who work on contract. The program authors are generally consulted as to any changes in their works, so little of this will come as a surprise to them.

Most of the programs published by ISI are, indeed, volunteered by the programmers. But there are some that are solicited from creditable programmers, and there is some serious discussion about getting some in-house programmers to write a few needed types of programs that have not yet been volunteered or have not been received through solicitations.

The report stated that program evaluation time at ISI was two to three months. About 75 percent of the rejections are made within the first few days, and many programmers have received this bad news within a week of sending in their programs. Once a program gets by the preliminary screening, it is admittedly a lengthy process. But this is to the advantage of the programmer and to the customers. Programs that appear to have promise are sent out to associate editors for evaluation and possible improvement. Only about 25 percent of the programs are rejected after this more extensive evaluation, so the preliminary check appears to be valid and effective.

One of the major differences between ISI and many (if not most) other software publishers is the quality of the finished product. If a program makes it through the lengthy process at ISI, it is a good program. Customers and dealers have found that they can depend upon every ISI package to be top-notch and a very good value. Yes, it does take longer to make sure the quality is always good, but this is of critical importance in the long run. Firms that make quick decisions have a very poor quality record.

The documentation for ISI is mostly done inhouse. Obviously, the better the material from the author, the faster the program can be produced. ISI has a complete editorial staff to write and edit the documentation, set it in type, paste it up for printing, shoot the negatives for printing, etc. Many of the instruction booklets are even printed in the ISI pressroom. The volume of orders has reached the point where the in-house presses can't handle them, so some instruction booklets are printed by outside printers. (The developing plans for a new ISI building include a much larger printing department.)

The biggest difference between software publishers is in marketing. Small firms have trouble getting the interest of most dealers, since the bookkeeping involved soon becomes prohibitive. Thus, a firm such as Instant Software, with over a thousand released programs from which to choose, greatly simplifies the display and bookkeeping problems. Then,

Programmers will have to be idiots to bother to write programs for sale if they get little out of it.

too, ISI reps visit most stores once a month to help them with their displays, to acquaint the salespeople with the new releases, to pick up slow-moving packages or to look into any problems. It is this network of reps that has enabled ISI to reach more stores-well over 400 stores worldwide at present-than any other producer of software.

The royalties on ISI programs are normally 20 percent of the ISI gross. If the program is sold by mail order, then the author receives 20 percent of the retail price. If a program sells to a store at 33 percent discount, the author gets 20 percent of that receipt. About 90 percent of the program sales at present are via dealers. This percentage seems to be increasing as the dealer network grows.

Articles about software publishing would be of more value if they were better researched. If a programmer just goes by the meager facts presented in such a survey, he could lose thousands of dollars in royalties by being conned into going with a firm with fast action and small distribution. And at least one of the firms referenced in the report has been fleecing programmers, despite the implied

seal of approval given by the publishing of the

### **Program Theft**

I recently received through the mail a Hayden software catalog, accompanied by a letter that offered a ten-day free examination of the programs. I'm reasonably honest, but I'm not sure I could withstand that kind of temptation. I suspect that Hayden is so used to selling books this way that they went right ahead and used the same approach for their computer programs.

While publishing books and computer programs have many similarities, there are some important differences. A book is very difficult and expensive to copy, so ten-day free offers are a valid selling method. Computer programs, which are usually more expensive than books, are so simple to copy that it is pathetic. Free examination offers make no sense in this field. Most of us are honest as long as you don't tempt us too far. But it is so simple to send away for the whole catalog of Hayden programs, dump a copy on a cassette and then return them that I doubt that this sort of nonsense will continue.

That brings me to the thinly disguised services aimed right at program copiers. A chap recently started up a "program library" service that would lend computer programs for a fraction of the regular sale price. Needless to say, Instant Software, which was in his catalog, is preparing a suit to stop this sort of theft.

I've had several letters telling me of clubs that are allowing, or even encouraging, the copying of programs. I hope that these clubs are incorporated, because I'd hate to have to sue every member of the club instead of just the incorporated club itself. Where there is no corporation, every member is liable for the actions of the club. The usual practice is to sue all members and then really go after those with

It is only by pursuing these thefts of programs that the industry will be able to protect the authors of programs. And it is only by protecting the ability to pay good royalties that we shall have the programs that will allow microcomputers to grow in their sales. To a great extent, much of the future of the whole industry rests on the ability of software firms to support the systems. Programmers will have to be idiots to bother to write programs for sale if they get little out of it.

While all this makes sense to everyone, people continue to run off disk copies of dozens or even hundreds of programs at the club, so why pass it up? Well, I can't speak for the other firms in the business, but if just one person in your club spills the beans to ISI, he stands a good chance of making out rather well. We offer a \$10,000 reward for such information and are very serious about it. We might well collect quite a bit more than that in damages.

Give programmers a break and put a stop to program theft wherever you see it being condoned. I think you'll find very few computer stores that will allow this anymore. There is just far too much for them to lose.

# Take a byte.

Glaume CP/M for Apple II

Available naw!

All Lifeboat programs require CP/M,
unless otherwise stated.

Software for most popular 8080/780

Software for most popular 8080/Z80 computer disk systems

Software | Manual | Manual | Alone

☐ CP/M\* FLOPPY DISK OPERATING SYSTEM—Digital Research's operating system configured for many popular micro-computers

\	System	Version	Price	) N
,	Apple II*	. 2.x	.350/25	O V
7	SoftCard* with Z80			١
	Microsoft BASIC version 5	5		
	with high resolution			
	graphics			
	North Star Single Density	. 1.4	.145/25	V 1
	North Star Double Density .	. 1.4	.145/25	1 0
	North Star Single Density .	. 2.x	.170/25	Ne
	North Star Double/Quad	. 2.x	.170/25	1/
	Durango F-85	. 2.x	.170/25	
	iCOM Micro-Disk 2411	. 1.4	.145/25	
	iCOM 3712	. 1.4	.170/25	V * 1
	iCOM 3812	. 1.4	.170/25	* M
	Mits 3202/Altair 8800	. 1.4	.145/25	1
	Heath H8 + H17	. 1.4	.145/25	<b>⊛</b> ' −
	Heath H89	. 1.4	.145/25	₩.
	Heath H89 by Magnolia	. 1.4	.250/25	<b>\rightarrow</b>
	Heath H89 by Magnolia	. 2.x	.300/25	
	Onyx C8001	. 2.x	.300/25	$\Diamond$
	Ohio Scientific C3	. 2.x	.200/25	
	TRS-80 Model I	. 1.4	.145/25	<b>₩</b>
	TRS-80 Model II	. 2.x	.170/25	1
	TRS-80 Model II + Corvus	. 2.x	.250/25	10
	Processor Technology			1/2
	Helios II			1
	Cromemco System 3	. 1.4	.145/25	
	Intel MDS Single Density	. 1.4	.145/25	
	Intel MDS Single Density	. 2.x	.170/25	
	Micropolis Mod I	. 1.4	.145/25	(V)
	Micropolis Mod II	. 1.4	.145/25	(V)

release soon: North Star Double/Quad + Corvus ...... North Star Horizon HD-1 ... Ohio Scientific C3-C Micropolis Mod II . . . Mostek MDX STD iCOM 4511/Pertec D3000 . . 2.x . . . . 375/25 \*+

The following configurations are scheduled for

Software consists of the operating system, text editor, assembler, debugger and other utilities for file management and system maintenance. Complete set of Digital Research's documentation and additional implementation notes included. Systems marked and "include firmware on 2708 and 2716. Systems marked + include firm the property of the systems marked in the systems in the syste ware on 2708 and 2716. Systems marked + in-clude 5440 media charge. Systems marked ® require the special ® versions of soft-ware in this catalog. Systems marked ® have minor variants available to suit console inter-face of system. Call or write for full list of op-tions. ◊ includes hardware addition to allow our standard versions of software to run under it.

- Z80 DEVELOPMENT PACKAGE Consists Z80 DEVELOPMENT PACKAGE—Consists of: (1) disk file line editor, with global inter and intra-line facilities; (2) Z80 relocating assembler. Zilog/Mostek memonics, conditional assembly and cross reference table capabilities; (3) linking loader producing absolute Intel hex disk file ...\$95/\$20
- DTDT—Z80 Monitor Debugger to break and examine registers with standard Zilog/
  Mostek mnemonic disassembly displays. \$35 when ordered with Z80 Development Package ...\$50/\$10

### AVOCET SYSTEMS

- ☐ XASM-68 Non-macro cross-assembler with nested conditionals and full range of pseudo operations. Assembles from standard Motorola MC6800 mnemonics to Intel hex ...\$200/\$25
- ☐ XASM-65 As XASM-68 for MOS Technology MCS-6500 series mnemonics . . . . . \$200/\$25
- ☐ XASM-18 — As XASM-68 for RCA 1802 .....\$200/\$25

Software with Manual Alone

SMAL/80 Structured Macro Assembler 

### **PHOENIX SOFTWARE ASSOCIATES**

- PHOENIX SOFTWARE ASSOCIATES

  PASM\*—Z80 macro assembler, Intel/TDL

  mnemonics. Generates Intel hex format or relocatable code in either TDL Object Module
  format or PSA Relocatable Binary Module format. Supports text insertion, conditional
  branching within macros, recursive macro calls
  and parameter passing. \$129/\$25

  EDIT—Character oriented text file editor, Includes macro definition capabilities. Handles
  insertion, deletion, searching, block move, etc.
  for files of any length. Does not require a
  CRT. \$129/\$25

  PLINK\*—Two pass disk-to-disk linkage edi-
- DPLINE TWO pass disk-to-disk linkage editor/loader which can produce re-entrant, ROMable code. Can link programs that are larger than available memory for execution targeted on another machine. Full library capabilities. Input can be PSA Relocatable Binary Module, TDL Object Module or Microsoft REL files. Output can be a COM file, Intel hex file. TDL Object Module or PSA Relocatable file.

  \$129/\$25
- file. \$129/\$25 j

  BUG\* and μBUG\*—Z80 interactive machine level debugging tools for program development. BUG has full symbolic trace and interactive assembly (mnemonics compatible with PASM). Dynamic breakpoints and conditional traps while tracing (even through ROM!), μBUG is a subset of BUG and is used in memory limited situations \$129/\$25

### DIGITAL RESEARCH

- ☐ MP/M—Installed for single density MDS-800. Multi-processing derivative of the CP/M operating system. Manual includes CP/d documentation ......\$300/\$50
- MAC-8080 Macro assembler. Full Intel macro definitions. Pseudo Ops include RPC, IRP, REPT, TITLE, PAGE, and MACLIB. Produces absolute hex output plus symbol table file for use by SID and ZSID (see below) \$120/\$15
- SID-8080 Symbolic debugger. Full trace, pass count and breakpoint program testing. Has backtrace and histogram utilities. When used with MAC, provides full symbolic display of memory labels and equated values .\$105/\$15
- ZSID-Z80-Symbolic debugger with all fea-
- **TEX**—Text output formatter to create paginated, page-numbered and justified copy. Output can be directed to printer or disk ...\$105/\$15
- DESPOOL Utility program to permit simultaneous printing from text files while executing other programs \$80/\$10

  tiny C Interactive interpretive system for teaching structured programming techniques.

  Manual includes full source listings .\$105/\$50
- Manual includes full source listings. \$105/\$50
  BDS C COMPILER Supports most features of language, including Structures, Arrays, Pointers, recursive function evaluation, overlays. Includes linking loader, library manager, and library containing general purpose, file I/O, and floating point functions. Lacks initializers, statics, floats and longs. Documentation includes "The C PROGRAMMING LANGUAGE" by Kernighan and Ritchie ........\$145/\$25

### MICROSOFT

- MICRUSUP:

  BASIC-80—Disk Extended BASIC, ANSI
  Compatible with long variable names,
  WHILE/WEND, chaining, variable length file
- records \$325/\$z5

  BASIC COMPILER—Language compatible

  with BASIC-80 and 3-10 times faster execution.

  Produces standard Microsoft relocatable binary output. Includes MACRO-80. Also linkable to FORTRAN-80 or COBOL-80 code modules \$350/\$25

- SEARCH, 3-dimensional arrays, compound and abbreviated conditions, nested IF. Powerful interactive screen-handling extensions. Includes compatible assembler, linking loader, and relocatable library manager as described under MACRO-80 ... \$700/\$25
- MACRO-80 8080/Z80 Macro Assembler. Intel and Zilog mnemonics supported. Relocatable linkable output. Loader, Library Manager and Cross Reference List utilities included. \$149/\$15
- muSIMP/muMATH-muSIMP is a high level musiMP/muMAIH—musiMP is a nign lever programming language suitable for symbolic and semi-numerical processing. Implemented using a fast and efficient interpreter requiring only 7K bytes of machine code. muMATH is a package of programs written in musiMP. The package performs sophisticated mathematical functions. Keeps track of up to 611 digits. Performs matrix operations on arrays: transpose forms matrix operations on a rays. Lanspose, multiply, divide, inverse and other integer powers. Logarithmic, exponential, trigonometric simplification and transformation, symbolic differentiation with partial derivatives, symbolic integration of definite and indefinite integrals. Requires 40K CP/M. \$250/\$20
- muLISP-79 Microcomputer implementation of LISP. The interpreter resides in only 7K bytes of memory yet includes 83 LISP functions. Has infinite precision integer arithmetic expressed in any radix from 2 to 36. muLISP-79 includes complete trace facility and a library of useful functions and entertaining sample programs \$200.515 programs. .
- EDIT-80 Very fast random access text editor for text with or without line numbers. Global and intra-line commands supported. File compare utility included. ...\$89/\$15
- PASCAL/M\*-Compiles enhanced Standard PASCAL/M\*—Compiles enhanced Standard Pascal to compressed efficient Pode. Totally CP/M compatible. Random access files. Both 16 and 32-bit Integers. Runtime error recovery. Convenient STRINGs. OTHERWISE clause on CASE. Comprehensive manual (90 pp. indexed). SEGMENT provides overlay structure. INPORT, OUTPORT and untyped files for arbitrary I/O. Requires 56K CP/M. Specify 1, 8080 CP/M. 2) Z80 CP/M. or 3) Cromemco CDOS. \$175/\$20
- CDOS. \$175/\$20

  PASCAL/Z Z80 native code PASCAL compiler. Produces optimized, ROMable re-entrant code. All interfacing to CP/M is through the support library. The package includes compiler, relocating assembler and linker, and source for all library modules. Variant records, strings and direct I/O are supported. Requires 56K CP/M. \$395/\$25
- PASCAL with—Subset of standard PASCAL.
  Generates ROMable 8080 machine code.
  Symbolic debugger included. Supports interrupt procedures, CP/M file I/O and assembly language interface. Real variables can be BCD, software floating point, or AMD 9511 hardware floating point. Includes strings enumerations and record data types. Manual explains BASIC to PASCAL conversion. Requires 32K. \$250/\$30
- ALGOL-60 Powerful block-structured lan-ALGOL-60 — Powerful block-structured lan-guage compiler featuring economical run-time dynamic allocation of memory. Very compact (24K total RAM) system implementing almost all Algol 60 report features plus many powerful extensions including string handling direct disk address I/O etc. \$199/\$20
- CBASIC-2 Disk Extended BASIC Non-interactive BASIC with pseudo-code compiler and run-time interpreter. Supports full file con-trol, chaining, integer and extended precision variables, etc. \$120/\$15

### **MICRO FOCUS**

MICRO FOCUS

☐ STANDARD CIS COBOL—ANSI '74 COBOL

© standard compiler fully validated by U.S. Navy
tests to ANSI level 1. Supports many features to
level 2 Including dynamic loading of COBOL
modules and a full ISAM file facility. Also, program segmentation, interactive debug and
powerful interactive extensions to support protected and unprotected CRT screen formatting
from COBOL programs used with any dumb
terminal ...\$850/\$50

FORMS 2—CRT screen editor. Output is COBOL data descriptions for copying into CIS COBOL programs. Automatically creates a query and update program of indexed files using CRT protected and unprotected screen formats. No programming experience needed. Output program directly compiled by STAN-DARD CIS COBOL ....\$200/\$20

### EIDOS SYSTEMS

- KISS Keyed Index Sequential Search. Offers complete Multi-Keyed Index Sequential and Direct Access file management. Includes built-in utility functions for 16 or 32 bit arithmetic, string/integer conversion and string compare.
  Delivered as a relocatable linkable module in
  Microsoft format for use with FORTRAN-80 or
  COBOL-80, etc. \$335/\$23
- KBASIC Microsoft Disk Extended BASIC version 4.51 integrated by implementation of nine additional commands in language. Package includes KISS. REL as described above. and a sample mail list program. ...\$585/\$45 To licensed users of Microsoft BASIC-80 (MBASIC) ...\$435/\$45
- □ XYBASIC Interactive Process Control BASIC Full disk BASIC features plus unique commands to handle byte rotate and shift and to test and set bits. Available in several ver-

SIONS:	
Integer ROM squared	\$350/\$25
Integer CP/M	\$350/\$25
Extended ROM squared	\$450/\$25
Extended CP/M	\$450/\$25
Extended Disk CP/M	
Integer CP/M Run Time Compiler	\$350/\$25
Extended CP/M Run Time Compiler	\$450/\$25

- ☐ RECLAIM—A utility to validate media under CP/M. Program tests a diskette or hard disk surface for errors, reserving the imperfections in invisible files, and permitting continued usage of the remainder. Essential for any hard disk. Requires CP/M version 2. . . . . . \$80/\$5
- BASIC UTILITY DISK Consists of: (1) BASIC UTILITY DISK — Consists of: (1) CRUNCH-14— Compacting utility to reduce the size and increase the speed of programs in Microsoft BASIC 4.51, BASIC-8.0 and TRS-80 BASIC. (2) DPFUN—Double precision subroutines for computing nineteen transcendental functions including square root, natural log, log base 10, sine, arc sine, hyperbolic arc sine, etc. Furnished in source on diskette and documentation ...\$50/\$35
- □ STRING/80 Character string handling plus routines for direct CP/M BDOS calls from FORTRAN and other compatible Microsoft lan-FOHI HAN and other compatible Microsoft lan-guages. The utility library contains routines that enable programs to chain to a COM file, retrieve command line parameters and search file direc-tories with full wild card facilities. Supplied as linkable modules in Microsoft format. \$95/\$20
- STRING/80 source code available separately— ......\$295/NA
- THE STRING BIT—FORTRAN character string handling. Routines to find, fill, pack, move, separate, concatenate and compare character strings. This package completely eliminates the problems associated with character string handling in FORTRAN. Supplied with source ...\$65/\$15
- □ VSORT Versatile sort/merge system for fixed ⊕ length records with fixed or variable length fields. VSORT can be used as a stand-alone package or loaded and called as a subroutine from CBASIC-2. When used as a subroutine, VSORT maximizes the use of buffer space by saving the TPA on disk and restoring it on com-pletion of sorting. Records may be up to 255 bytes long with a maximum of 5 fields. Upper/ lower case translation and numeric fields supported. \$175/\$20 VSORT - Versatile sort/merge system for fixed
- □ CPM/374X Has full range of functions to create or re-name an IBM 3741 volume, display directory information and edit the data set contents. Provides full file transfer facilities between 3741 volume data sets and CP/M files ...\$195/\$10

### Coming Soon

- T/MAKER—Powerful new tool for preparing management reports with tabular data. Makes financial modeling projects easy. Do you want a weekly profitability report? Set up the table and compute. Just change the sales figures for next week and compute. You have a new report!

  T/MAKER includes a full screen editor for setting up tables which pages left, right, up and down. Compute includes standard arithmetic, percents, exponents, common transcendental functions, averages, maxima, minima, projections, etc. Requires 48K CP/M and CBASIC-2. \$275/825 ■ BSTAM — Utility to link one computer to another 
  also equipped with BSTAM. Allows file transfers 
  at full data speed (no conversion to hex), with 
  CRC block control check for very reliable error 
  detection and automatic retry. We use it! It's 
  great! Full wildcard expansion to send \* COM, 
  etc. 9600 baud with wire. 300 baud with phone 
  connection. Both ends need one. Standard and 
  @ versings ear tell to one enother 
  \$\frac{1}{2}\$ (STAM) versions can talk to one another. .\$150/\$10
   WHATSIT?\* — Interactive data-base system SELECTOR III-C2—Data Base Processor to create and maintain multi-key data bases. Prints formatted sorted reports with numerical summaries or mailing labels. Comes with sam-ple applications, including Sales Activity, Inven-tory, Payables, Receivables, Check Register, and Client/Patient Appointments, etc. Requires CBASIC-2. Supplied in source ... \$295/\$20
- using associative tags to retrieve information by subject. Hashing and random access used for fast response. Requires CBASIC-2 .\$175/\$25 ☐ SELECTOR III-C2—Data Base Processor to
- CBASIC-2. Supplied in source ... \$295/\$20
  GLECTOR General Ledger option to
  SELECTOR III-C2. Interactive system provides
  for customized COA. Unique chart of transaction types insure proper double entry bookkeeping. Generates balance sheets, P&L
  statements and journals. Two year record allows for statement of changes in financial position report. Supplied in source. Requires
  SELECTOR III-C2. CBASIC-2 and 56K
  system. ... \$350/\$25
- system. \$350/\$25

  CBS—Configurable Business System is a comprehensive set of programs for defining custom data files and application systems without using a programming language such as BASIC, FORTARN, etc. Multiple key fields for each data file are supported. Set-up program customizes system to user's CRT and printer. Provides fast and easy interactive data entry and retrieval with transaction processing. Report generator program does complex calculations with stored and derived data, record selection with multiple criteria, and custom formats. Sample inventory and mailing list systems included. No support language required. \$295/\$40

### MICRO DATA BASE SYSTEMS

- MICRO DATA BASE SYSTEMS

  HDBS—Hierarchical Data Base System.
  CODASYL oriented with FILEs, SETs, RECORDs and ITEMs which are all user defined.
  ADD, DELETE, UPDATE, SEARCH, and
  TRAVERSE commands supported. SET ordering is sorted, FIFO, LIFO, next or pior. One to many set relationship supported. Read/write protection at the FILE level. Supports FILEs which event over multiple florey as hard disk. which extend over multiple floppy or hard disk
- devices.

  MDBS Micro Data Base System. Full network data base with all features of HDBS plus multi-level read/write protection for FILE, SET, REC-ORD and ITEM. Explicit representation of one to one, one to many, many to many, and many to one SET relationships. Supports multiple owner and multiple record types within SETs. HDBS files are fully compatible.
- ☐ HDBS-Z80 version ......\$250/\$40\*\* ☐ MDBS-Z80 version ......\$750/\$40\*\*
  8080 version available at \$75 extra.

When ordering, specify one of the language interfaces listed below. Additional language interfaces available at time of purchase for \$100 or \$125 if purchased later.

"The single manual covering HDBS and MDBS when purchased alone comes without specific language interface manual. Manuals are available for the following Microsoft lan-

### MICROPRO

- SUPER-SORT I -- Sort, merge, extract utility as absolute executable program or linkable mod-ule in Microsoft format. Sorts fixed or variable records with data in binary, BCD. Packed Deci-mal, EBCDIC, ASCII, floating & fixed point, ex-ponential, field justified, etc. Even variable number of fields per record! ....\$225/\$25

- □ DATASTAR—Professional forms control entry

  □ and display system for key-to-disk data capture. Menu driven with built-in learning aids. Input field verification by length, mask, attribute (i.e. upper case, lower case, numeric, auto-dup, etc.). Built-in arithmetic capabilities using keyed data, constant and derived values. Visual feedback for ease of forms design. Files compatible with CP/M-MP/M supported languages. Requires 32K CP/M.

   \$350/\$35

- WORD-STAR Menu driven visual word pro-WORD-STAR—Menu driven visual word pro-cessing system for use with standard terminals. Text formatting performed on screen. Facilities for text paginate, page number, justify, center and underscore. User can print one document while simultaneously editing a second. Edit facilities include global search and replace, Read/Write to other text files, block move, etc. Requires CRT terminal with addressable cursor resitioning. positioning . .....\$445/\$40
- WORD-STAR-MAIL-MERGE As above with
- □ WORD-STAR Customization Notes—For sophisticated users who do not have one of the many standard terminal or printer configurations in the distribution version of WÖRD-STAR ...\$NA/\$95
- WORD-MASTER Text Editor—In one mode has superset of CP/M's ED commands including global searching and replacing, forwards and backwards in file in video mode, provides full screen editor for users with serial addressable-cursor terminal .\$145/\$25
- TEXTWRITER III Text formatter to justify and paginate letters and other documents. Special paginate letters and other documents. Special features include insertion of text during execution from other disk files or console, permitting recipe documents to be created from linked fragments on other files. Has facilities for sorted index, table of contents and footnote insertions, ideal for contracts, manuals, etc. Now compatible with Electric Pencil\* and Word-Star prepared files ...\$125/\$20

New lawer prices for application Software

### PEACHTREE SOFTWARE

General accounting software for small businesses. Each product can be used alone or with automatic posting to the general ledger Supplied in source for Microsoft BASIC 4.51.

GENERAL LEDGER	\$530/\$40
ACCOUNTS PAYABLE	\$530/\$40
ACCOUNTS RECEIVABLE	\$530/\$40
PAYROLL	\$530/\$40
INVENTORY	\$660/\$40
ALSO:	
MAILING ADDRESS	
PROPERTY MANAGEMENT	\$925/\$40

### GRAHAM-DORIAN SOFTWARE SYSTEMS

Comprehensive accounting software written in CBASIC-2 and supplied in source code. Each software package can be used as a stand-alone system or integrated with the General Ledger for automatic posting to ledger accounts. Re-

quires CBASIC-2.
GENERAL LEDGER\$805/\$40
ACCOUNTS PAYABLE\$805/\$40
ACCOUNTS RECEIVABLE\$805/\$40
INVENTORY SYSTEM\$555/\$40
JOB COSTING\$805/\$40
APARTMENT MANAGEMENT\$805/\$40
CASH REGISTER\$805/\$40

POSTMASTER—A comprehensive package

for mail list maintenance that is completely
menu driven. Features include keyed record
extraction and label production. A form letter
program is included which provides neal telters
on single sheet or continuous forms. Includes
NAD file translator. Requires CBASIC-2
\$150/\$20

### STRUCTURED SYSTEMS GROUP

Complete interactive accounting software for business. Each product can be used standalone or with automatic posting to the general ledger. Each product is thoroughly tested and very well documented. Each product requires CBASIC-2.

GENERAL LEDGER	\$820/\$40
ACCOUNTS RECEIVABLE	
ACCOUNTS PAYABLE	\$820/\$40
PAYROLL	\$820/\$40
INVENTORY CONTROL	\$820/\$40

### **NEW! NEWSLETTER** FROM LIFEBOAT

- Latest Version Numbers List of Software
- Update on CP/M Users Group
- LIFELINES The Great ZOSO Speaks Out from Behind the Scenes

\$18 ppd. for 12 issues (U.S., Canada,

Mexico). Elsewhere **\$40**. Send Check to "Lifelines," 1651 Third Avenue, New York, N.Y. 10028 or use your VISA or Mastercharge — call (212) 722-1700

Copyright © 1980 Lifeboat Associates. No portion of this advertisement may be reproduced without prior permission.

- NAD Name and Address selection system—
   Interactive mail list creation and maintenance program with output as full reports with reference data or restricted information for mail labels. Transfer system for extraction and transfer. fer of selected records to create new files. Requires CBASIC-2 ......\$100/\$20
- ☐ QSORT—Fast sort/merge program for files with fixed record length, variable field length information. Up to five ascending or descending keys. Full back-up of input files created \$100.25 for \$100.

### \* \* \* \* \* \* \* \* \* $\star$ $\star$ $\star$ $\star$ $\star$

- ☐ HEAD CLEANING DISKETTE—Cleans the
- □ FLIPPY DISK KIT Template and instructions to modify single sided 5¼" diskettes for use of second side in single sided drives . . . . \$12.50
- ...\$7.95 ...\$16.95 ...\$8.95 8", Kit ...... 8", Rings only ...
- ☐ PASCAL USER MANUAL AND REPORT-By Jensen and Wirth. The standard textbook on the language. Recommended for use by Pascal/Z, Pascal/M and Pascal/MT users \$12

- THE C PROGRAMMING LANGUAGE-By Kernighan and Ritchie. The standard textbook on the language. Recommended for use by BDS C, tiny C, and Whitesmiths C users . .\$12
- ACCOUNTS PAYABLE & ACCOUNTS RECEIVABLE CBASIC By Osborne/McGraw-Hill .\$20
- GENERAL LEDGER CBASIC By Osborne/McGraw-Hill .....\$20
- □ PAYROLL WITH COST ACCOUNTING— CBASIC—by Osborne/McGraw-Hill .....\$20
- ☐ LIFEBOAT DISK COPYING SERVICE— Transfer data or programs from one media for-mat to another at a moderate cost ...from \$25

### $\star$ $\star$ $\star$ $\star$ $\star$ **Hearty Appetite.** $\star$ $\star$ $\star$ $\star$ $\star$

\*CP/M and MP/M are trademarks of Digital Re-

search. Z80 is a trademark of Zilog, Inc. UNIX is a trademark of Bell Laboratories. WHATSIT? is a trademark of Computer Head-

Electric Pencil is a trademark of Michael Electric Pencil is a trademark of Michael Shrayer Software.
TRS-80 is a trademark of Tandy Corp.
Pascal/M is a trademark of Sorcim.
SoftCard is a trademark of Microsoft.
Apple is a trademark of Apple Computer.
PASM, PLINK, BUG and "BUG are trademarks of Phoenix Software Associates Ltd.
CPAids is a trademark of Computer Tax Service. Inc.

- Recommended system configuration consists of 48K CP/M, 2 full size disk drives, 24 x 80 CRT and 132 column printer.
- Modified version available for use with CP/M as implemented on Heath and TRS-80 Model I computers.
- User license agreement for this product must be signed and returned to Lifeboat Associates before shipment may be made.
- ① This product Includes/eXcludes the language ® manual recommended in Condiments.
- ® Serial number of CP/M system must be
- Requires Z80 CPU.

### Ordering Information

MEDIA FORMAT ORDERING CODES When ordering, please specify format code

### LIFEBOAT ASSOCIATES MEDIA FORMATS LIST

Diskette, cartridge disk and cartridge tape format codes to be specified when ordering software for listed computer or disk systems. All software products have specific requirements in terms of hardware or software support, such as MPU type, memory size, support operating system or language.

Computer system	Format Code	Computer system	Format Code
Altair 8800 Disk	.See MITS 3200	IMS 5000	RA
Altos		IMS 8000	
Apple + SoftCard 13	SectorRG	IMSAI VDP-40	
Apple + SoftCard 16	SectorRR	IMSAI VDP-42	
BASF System 7100	RD	IMSAI VDP-44	R5**
Blackhawk Single De		IMSAI VDP-80	
Blackhawk Micropoli		IntecolorS	ee ISC Intecolor
CDS Versatile 3B	Q1	Intel MDS Single Der	sityA1
CDS Versatile 4	Q2	Intertec SuperBrain D	OS 0.1R7
COMPAL-80		Intertec SuperBrain D	
Cromemco System 3	3A1*	Intertec SuperBrain D	
Cromemco Z2D		ISC Intecolor 8063/8	360/8963A1
CSSN BACKUP (tap	e)T1#	Kontron PSI-80	RF
Delta		Meca 51/4"	P6
Digi-Log Microterm I	IRD	Micromation	
Digital Microsystems	A1*	(Except TRS-80 be	low)A1*
DiscusSe	e Morrow Discus	Micropolis Mod I	
Durango F-85	RL	Micropolis Mod II	Q2
Dynabyte DB8/2	R1	MITS 3200/3202	
Dynabyte DB8/4		Morrow Discus	A1*
Exidy Sorcerer + Life		Mostek	
Exidy Sorcerer + Ex		MSD 51/4"	
Heath H8 + H17/H2	7 P4	North Star Single Der	neity P1
Heath H89 + Lifebox	at CP/M P4	North Star Double/Qu	
Heath H89 + Magno		Nylac Single Density	
Helios II .See Proce		Nylac Micropolis Mod	
Horizon	See North Star	Ohio Scientific C3	
iCOM 2411 Micro Flo		Onyx C8001	
ICOM 3712		Pertec PCC 2000	
ICOM 3812		Processor Technolog	
ICOM 4511 5440 Ca	rtridge	Quay 500	
iCOM 4511 5440 Ca CP/M 1.4	D1#	Quay 520	
ICOM 4511 5440 Ca	rtridge	RAIR Single Density	
CP/M 2.2	D2#	RAIR Double Density	

Prices F.O.B. New York Shipping, handling and C.O.D. charges extra.

Manual cost applicable against price of subsequent software purchase.

The sale of each proprietary software package conveys a license for use on one system only

V/SA master charge

Single-Side Single-Density disks are supplied for use with Double-Density and Double-Side 8" soft sector format systems. IMSAI formats are single density with directory offset of zero.

A media surcharge of \$25 for or ders on tape formats T1 and T2 and of \$100 for orders on disk fo D1 and D2 will be added.

The list of available formats is subject to change without notice. In case of uncertainty, call to confirm the format code for any particular equipment.

Computer system	Format Code
Research Machines 8"	A1
Research Machines 51/4"	RH
REX	Q3
Sanco 7000 51/4"	RQ
SD Systems 8"	
SD Systems 5¼"	
SorcererSee E	xidy Sorcerer
Spacebyte	
SuperBrain	.See Intertec
Tarbell	
TEI 51/4"	R3
TEI 8"	
ThinkertovsSee M	orrow Discus
TRS-80 Model I 51/4"	
TRS-80 Model I + FEC I	Freedom RN
TRS-80 Model I + Micro	mationA4*
TRS-80 Model I + Omiki	ron 51/4" RM
TRS-80 Model I + Omik	ron 8"A1
TRS-80 Model I+ Shuffle	
TRS-80 Model II	
VDP-40/42/44/80	See IMSAI
Vector MZ	
Versatile See C	DS Versatile
Vista V80 51/4" Single De	
Vista V200 51/4" Double I	
Zenith Z89 + Lifeboat Cf	
Zenith Z89 + Magnolia C	P/M . P7



### **Proganal**

I recently received an interesting and impressive utility program for the 8K PET from Benson Greene, 210 Fifth Ave., New York, NY 10010. The program is called Proganal and provides two separate functions: It can list a BASIC program with special formatting and cursor character conversion and can generate a detailed analysis of the actual content and structure of the program. This program was extremely interesting to me, since it follows the line of several programs I've worked on in the

The program listings produced by Proganal are formatted with page indications for folding, headings and binding instructions. This is convenient, since the output is designed for five-inch-wide roll paper. The page indications make it easy to fold the listings into a usable form. A separating line after any breaks in the logic sequence of the program is also provided.

All PET graphics and cursor controls are printed in a form that prevents misinterpretation, regardless of any printer limitations. All hidden, secret lines that contain delete graphics are printed in full, and any shifted blanks are identified

The detailed program analysis includes a wealth of information for the subject BASIC program. It shows all program variables, sorted by name and type, with all line-number references indicated. All BASIC commands, along with their line-number references, are listed. Any functions or operators are tallied, showing the total number of times each is used in the program. Each branch instruction, along with every reference line for the branch "target" line, is listed.

At the end of the analysis, a summary report is printed showing the number of program lines and the range of line numbers used, the total number of BASIC instructions, the total number of variable references, the number of different variable names, the number of branches, the number of logic decisions, a relative complexity figure (shown as %) and the time to process the program file. The analysis output is also formatted and paged in the same format as that used for generating the program listing.

Proganal can handle programs with up to 300 distinct, separate line-number references for each letter of the alphabet, for each of the six types of variables. Currently, the BASIC program that is to be processed must first be saved in listing format and then read as a data file. Benson's cover letter stated that he was working on a newer version that would work with the 2040 disk and overcome this require-

For now, you must use a tape file so that the program can take a long time to run. I took

STAPLE	CURSOR CODES ARE NOTED IN BRACKETS WITH NO. OF REPEATS. GRAPHIC CODES ARE ASCII  CLEAR = CC] LEFT = CL] RIGHT = CR] HOME = CH] UP = CU] DOWN = CD] DELETE = CT] REVERSE=(V) OFF = CO] GRAPHIC=(G] BLANK = CB]K SHIFTED)   (<< LISTING >>>  100 :POKES9468,14 101 IPPEEK(1022)=8THENPOKE1022,128 105 GOSUB4100:R=5:B%=25:C%=60 106 D%=65:E%=80:F%=40:K%=C% 110 DIMM*(B%,A),B*(B%,A),C*(B%,3) 111 DIMD*(B%,A),B*(B%,A),C*(B%,3) 112 DIMG*(D%,1),H*(D%,2),J*(B%,3) 113 DIMJ*(A),R*(300),V*(15) 115 FORR=0TOD%:RERDGS(A,0):NEXT 121 C4*=CHR*(30):C\$*=CHR*(29) 122 CQ\$*=CHR*(34) 125 E*="TLRUDCHYOB 128 FORR=1TOE%:I*=I\$*"-":NEXT 130 L\$*=" ":LI*=L\$*+L\$*+L\$*+L\$* 135 L6*=" "":K\$*=L6*+L6*+"		
CURSOR CODES ARE NOTED IN BRACKETS WITH NO. OF REPEATS. GRAPHIC CODES ARE ASCII  CLEAR = CC]	CURSOR CODES ARE NOTED IN BRACKETS WITH NO. OF REPEATS. GRAPHIC CODES ARE ASCII  CLEAR = CC]	ST	APLE STAPLE
NO. OF REPEATS. GRAPHIC CODES ARE ASCII  CLEAR = CC] LEFT = CL] RIGHT = CR]  HOME = CHJ UP = (UJ DOWN = CD]  DELETE = CTJ REVERSE=(VJ OFF = COJ  GRAPHIC=CG] BLANK = CBJKSHIFTED)   (<< LISTING >>>  100 : POKE59468,14  101 IFPEEK(1022)=8THENPOKE1022,128  105 GOSUB4100:R=5:B%=25:C%=60  106 D%=65:E%=80:F%=40:K%=C%  110 DIMA*(B%,A),B*(B%,A),C*(B%,3)  111 DIMD*(B%,A),B*(B%,A),C*(B%,3)  112 DIMG*(D%,1),H*(D%,2),I*(B%,3)  113 DIMJ*(A),R*(300),V*(15)  115 FORR=0TOD%:READGS(A,0)*NEXT  121 C4\$=CHR*(30):C8\$=CHR*(29)  122 C0\$=CHR*(34)  125 E\$=CHR*(28)+"(LJCRJCUJCDJCCJCHJCVJC  OJCBJ"  126 F\$="TLRUDCHYOB  128 FORR=1TOE%: I\$=I\$+"-":NEXT  130 L\$=" ":L1\$=L\$+L\$+L\$+L\$+L\$+L\$  135 L6\$=" ":L1\$=L\$+L\$+L\$+L\$+L\$+L\$  135 L6\$=" ":CDJC2  B]"  140 GOSUB7000:OPEN3,3:OPEN4,U  150 PRINTL6\$L6\$L6\$L6\$  155 IFIN=0THENPRINT"(VJPUT DATA TAPE IN  TAPE #1":GOSUB2950:OPEN2,1,0  - PAGE 1 -	NO. OF REPEATS. GRAPHIC CODES ARE ASCII  CLEAR = CC] LEFT = CL] RIGHT = CR]  HOME = CHJ UP = (UJ DOWN = CD]  DELETE = CTJ REVERSE=(VJ OFF = COJ  GRAPHIC=CG] BLANK = CBJKSHIFTED)   (<< LISTING >>>  100 : POKE59468,14  101 IFPEEK(1022)=8THENPOKE1022,128  105 GOSUB4100:R=5:B%=25:C%=60  106 D%=65:E%=80:F%=40:K%=C%  110 DIMA*(B%,A),B*(B%,A),C*(B%,3)  111 DIMD*(B%,A),B*(B%,A),C*(B%,3)  112 DIMG*(D%,1),H*(D%,2),I*(B%,3)  113 DIMJ*(A),R*(300),V*(15)  115 FORR=0TOD%:READGS(A,0)*NEXT  121 C4\$=CHR*(30):C8\$=CHR*(29)  122 C0\$=CHR*(34)  125 E\$=CHR*(28)+"(LJCRJCUJCDJCCJCHJCVJC  OJCBJ"  126 F\$="TLRUDCHYOB  128 FORR=1TOE%: I\$=I\$+"-":NEXT  130 L\$=" ":L1\$=L\$+L\$+L\$+L\$+L\$+L\$  135 L6\$=" ":L1\$=L\$+L\$+L\$+L\$+L\$+L\$  135 L6\$=" ":CDJC2  B]"  140 GOSUB7000:OPEN3,3:OPEN4,U  150 PRINTL6\$L6\$L6\$L6\$  155 IFIN=0THENPRINT"(VJPUT DATA TAPE IN  TAPE #1":GOSUB2950:OPEN2,1,0  - PAGE 1 -	PROG	RAM: PROGANAL 3/10/80
HOME = EHJ UP = EUJ DOWN = EDJ DELETE = CTJ REVERSE=EVJ OFF = EOJ GRAPHIC=EGJ BLANK = EBK SHIFTED)   (<< LISTING >>>  100 : POKE59468,14  101 : IFPEEK(1022)=8THENPOKE1022,128  106 DX=65:EX=80:FX=40:KX=CX  110 : DIMA*(BX,A),B*(BX,A),C*(BX,A)  111 : DIMO*(BX,A),B*(BX,A),C*(BX,A)  112 : DIMG*(DX,1),H*(DX,2),I*(BX,A)  113 : DIMJ*(A),R*(380),V*(15)  115 : FORR=0TODX:READG*(A,0):NEXT  121 : C4*=CHR*(30):C8*=CHR*(29)  122 : C0*=CHR*(34)  126 : F*="TLRUDCHVOB  128 : FORR=1TOEX: I*=I*+"-":NEXT  130     L*=" ":L1*=L*+L*+L*+L*+L*  135     L6*=" ":L1*=L*+L*+L*+L*+L*  137     L6*=" ":L1*=L*+L*+L*+L*+L*  138     L*=" ":L1*=L*+L*+L*+L*+L*  139     L*=" ":L1*=L*+L*+L*+L*+L*  139     L*=" ":L1*=L*+L*+L*+L*+L*  140     GOSUB7000: OPEN3, 3: OPEN4, U  159     PRINTL64L64L64L64  155     IFIN=0THENPRINT"[V]PUT DATA TAPE IN  160     IFIN=1THENGOSUB1000  165     J=4:P=-1:O=35: GOSUB3000  170     IFPT=0RNDU)3THENGOSUB7500  175     A*="LISTING"  180     IFJOB=0THENN#="EXPANDED "+A*: IFPT=0  THENM=1  185     GOSUB3200: GOSUB2990: A*="":TS=TI  196     :P*="":S*="":V*=""  195     :U*=CU**HENG=":HENG**(10)THEN210  220     IFW=CU**HENG=1:GOTO400  230     P*=P*+U*  240     IFW=CO**HENG=1:HENG=0:U*="":GOTO29  250     IFW=CO**HENG=1:HENG=0:U*="":GOTO29  250     IFW=CO**HENG=1:HENG=0:U*="":GOTO29  250     IFW=CO**HENG=1:HENG=0:U*="":GOTO29  250     IFW=CO**HENG=1:HENG=0:U*="":":GOTO29  250     IFW=CO**HENG=1:HENG=0:U*="":":GOTO29  250     IFW=CO**HENG=1:HENG=0:U*="":":GOTO29  250     IFW=CO**HENG=1:HENG=0:U*="":":GOTO29  250     IFW=CO**HENG=1:HENG=0:U*="":":GOTO29  250     IFW=CO**HENG=1:HENG=0:U*="":":HENCS  250     IFW=CO**HENG=1:HENG=0:U*="":":GOTO29  250     IFW=CO**HENG=1:HENG=0:U*="":":HENCS  250     IFW=CO**HENG=1:HENG=0:U*="":":HENCS  250     IFW=CO**HENG=1:HENG=0:U*="":":":HENCS  250     IFW=CO**HENG=1:HENG=0:U*="":":":HENCS  250     IFW=CO**HENG=1:HENG=0:U*="":":":HENCS  250     IFW=CO**HENG=1:HENG=0:U*="":":":HENCS  250     IFW=CO**HENG=1:HENG=0:U*="":":":HENCS  250     IFW=CO**HENG=0:U*="":":HENCS  250     IFW=CO**HENG=0:U*="":":HEN	HOME = CH] UP = CU] DOWN = CD] DELETE = CT] REVERSE_CV] OFF = CO] GRAPHIC=CG] BLANK = CBIX SHIFTED)   (<< LISTING >>>  100 : POKE59468,14  101 IFPEEK(1022)=8THENPOKE1022,128  106 DV=65:EX=80:FX=40:KX=CX  110 DIMA*(BX,A),B*(BX,A),C*(BX,3)  111 DIMO*(BX,3),E*(BX,A),C*(BX,3)  112 DIMG*(DX,1),H*(DX,2),I*(BX,3)  113 DIMJ*(A),R*(300),V*(15)  115 FORR=0TODX:READGS(A,0):NEXT  121 C4\$=CHR*(30):C8\$=CHR*(29)  122 CQ\$=CHR*(34)  126 F\$="TLRUDCHVOB  128 FORR=1TOEX:I\$=I\$+"-":NEXT  130 L\$=" ":L1\$=L\$+L\$+L\$+L\$+L\$+L\$  135 L6\$=" ":L1\$=L\$+L\$+L\$+L\$+L\$+L\$  137 L6\$=" ":L1\$=L\$+L\$+L\$+L\$+L\$+L\$  138 IFIN=0THENPRINT"[V]PUT DATA TAPE IN		
100 :POKE59468,14 101 IFPEEK(1022)=STHENPOKE1022,128 105 GOSUB4100:R=5:B%=25:C%=60 106 D%=65:E%=80:F%=40:K%=C% 110 DIMM4(B%,A),B4(B%,A),C4(B%,3) 111 DIMD4(B%,A),B4(B%,A),C4(B%,3) 112 DIMG4(D%,1),H4(D%,2),I4(B%,3) 113 DIMJ4(A),R4(30),V4(15) 115 FORR=0TOD0%:REPDG4(A,0):NEXT 121 C4\$=CHR\$(30):C8\$=CHR\$(29) 125 E\$=CHR\$(20)+"[L]IR ILUJED ICC ILHIV VICO ILHI	100 :POKE59468,14 101 IFPEEK(1022)=STHENPOKE1022,128 105 GOSUB41002;PS; Bx=25; CX=60 106 Dx=65; EX=80; FX=40; KX;=CX 110 DIMM\$(BX;A), B\$(BX;A), CX(BX;A) 111 DIMD\$(BX;A), B\$(BX;A), F\$(BX;A) 112 DIMG\$(BX;A), B\$(BX;A), F\$(BX;A) 113 DIMJ\$(A), R\$(30), V\$(15) 115 FORR-0TODX; RERDG\$(A,0); NEXT 121 C4\$=CHR\$(30); C8\$=CHR\$(29) 125 C9\$=CHR\$(34) 125 E\$=CHR\$(20)*"[LUR UUDDIC OCH BV VIC 0 IN B]" 126 F\$="TLRUDCHYOB 128 FORR-1TOEX; I\$=I\$*"-"; NEXT 130 L\$*=" ":L\$\$=L\$*L\$*L\$*L\$*L\$*L\$* 131 L\$*="":K\$*L6*+L6*+L**L**L\$* 132 L\$*="":K\$*L6*+L6*+""_[D II 2 134 GOSUB7000; OPEN3, 3; OPEN4, U 135 PRINTL6\$L6\$+L6\$L6\$ 135 IFIN-0THENPRINT"[V JPUT DATA TAPE IN 1APE #1"; GOSUB2950; OPEN2, 1, 8  - PAGE 1 -	HOMI	E =CH1 UP =[U] DOWN =CD] ETE =[T] REVERSE=[V] OFF =[O]
101 IFPEEK(1022)=8THENPOKE1022,128 105 GOSUB41002;F=5:B%=05:C%=60 106 D%=65;E%=06;F%=40:K%=C% 110 DIMA*(B%,A),B*(B%,A),C*(B%,3) 111 DIMO*(B%,3),E*(B%,3),F*(B%,2) 112 DIMO*(B%,3),F*(B%,3),F*(B%,2) 113 DIMJ*(A),R*(300),V*(15) 115 FORR=0TDD%:RENDG*(A,0):NEXT 12 C4\$=CHR*(34) 125 E\$=CHR*(20)+"[L]CRICUICDICCICHICVICOICB] 126 F*="TLRUDCHVOB 128 FORR=1TOE%: I\$=I\$+"-":NEXT 130 L\$=" ":L\$=I\$+L\$+L\$+L\$+L\$+L\$ 135 L6\$=" ":K\$=L6\$+L6\$+"[D]C2 148 GOSUB7000:OPEN3,3:OPEN4,U 159 PRINTL6\$L6\$L6\$L6\$ 155 IFIN=0THENPRINT"[V]PUT DATA TAPE IN TAPE #1":GOSUB2950:OPEN2,1,0  - PAGE 1	101 IFPEEK(1022)=8THENPOKE1022,128 105 GOSUB4100:R=5:B%=25:C%=60 106 D%=65:E%=86:F%=40:K%=C% 110 DIMA*(B%,A),B*(B%,A),C*(B%,3) 111 DIMD*(B%,3),B*(B%,A),C*(B%,3) 112 DIMG*(D%,1),H*(D%,2),J*(B%,3) 113 DIMJ*(A),R*(300),V*(15) 115 FORR=0TOD%:RERDG*(A,0):NEXT 125 C4*=CHR*(34) 125 E*=CHR*(28)+"[L]IR ILUJEDJ*(CJ*(H)IEVJ*(D)IEJ*(B)] 126 F***** TLRUDCHVOB 128 FORR=1TOE%:I**=I**+"-":NEXT 130 L***** 135 L6***** 135 L6**** 135 L6**** 140 GOSUB7000:OPEN3,3:OPEN4,U 150 PRINTL64L64L64.64 155 IFIN=0THENPRINT*(V)PUT DATA TAPE IN 17PE #1*:GOSUB2950:OPEN2,1,0  - PAGE 1		<<< LISTING >>>
110 DIMA*(B%,A),B\$(B%,A),C\$(B%,3) 111 DIMO\$(B%,3),E\$(B%,3),F\$(B%,2) 112 DIMO\$(D%,1),H\$(D%,2),J\$(B%,3) 113 DIMJ\$(A),R\$(300),V\$(15) 115 FORR-0TOD%:READG\$(A,0):NEXT 121 C4\$=CHR\$(30) 125 E\$=CHR\$(20)+"[L]][R][U][D][C][H][V][ 0][B]]" 126 F\$="TLRUDCHVOB 128 FORR-1TOE%: I\$=I\$+"-":NEXT 130 L\$=" ":L]\$=I\$+L\$+L\$+L\$+L\$+L\$ 135 L6\$=" ":K\$=L6\$+L6\$+" [D][C][H][V][ 140 GOSUB7000:OPEN3,3:OPEN4,U 150 PRINTL6\$L6\$L6\$4.6\$ 155 IFIN=0THENPRINT"[V]PUT DATA TAPE IN 17PP #1":GOSUB2956:OPEN2,1,0  - PAGE 1	110 DIMA*(B%,A),B*(B%,A),C*(B%,3) 111 DIMD*(B%,3),E*(B%,3),F*(B%,2) 112 DIMA*(D%,2),H*(D%,2),J*(B%,3) 113 DIMJ*(A),R*(300),V*(15) 115 FORR-0TOD%:RERDGS(A,0):NEXT 121 C4*CHR*(30):C\$*CHR*(29) 122 CQ**CHR*(34) 125 E**CHR*(20)*"(L]ICRIUUICDICCICHICVICOICBI" 126 F**"TLRUDCHYOB 128 FORR-1TOE%:I\$*I\$*I*"-":NEXT 130 L**" ":L1**I\$*L\$*L\$*L\$*L\$*L\$*L\$*L\$* 135 L6**" ":K**L6**L6*L6*L6** "[D]ICRITCICBIT	101 105	IFPEEK(1022)=8THENPOKE1022,128 GOSUB4100:A=5:B%=25:C%=60
112 DIMG*(D*,1),H*(D*,2),I*(B*,3) 113 DIMJ*(A),R*(380),V*(15) 115 FORR=0TOD*:RERDG*(A,0):NEXT 121 C4*=CHR*(30):C8*=CHR*(29) 122 CQ*=CHR*(34) 125 E*=CHR*(20)+"[L]IRILUIDICCIHILVII 0IB]" 126 F*="TLRUDCHVOB 127 F*="TLRUDCHVOB 128 FORR=1TOE*:I*=I*+"-":NEXT 139 L*=" ":LI*=L*+L*+L*+L*+L* 135 L6*=" ":K*=L6*+L6*+" [D]IC 137 III 138 L*=" ":K*=L6*+L6*+" [D]IC 139 PRINTL6*L6*L6*L6* 139 FRINTL6*L6*L6*L6* 139 FRINTL6*L6*L6*L6* 130 IFIN=0THENPRINT"[V]PUT DATA TAPE IN 140 GOSUB7000:OPEN2,1,0  - PAGE 1 -	112 DIMG*(DX,1),H*(DX,2),I*(BX,3)  113 DIMJ*(A),R*(300),V*(15)  115 FORR=0TODX:READGS*(A,0):NEXT  121 C4\$=CHR*(30):C8\$=CHR*(20)  122 CQ\$=CHR*(34)  125 E\$=CHR*(20)*"[L]][R][U][D][C][H][V][  O][B]]"  126 F\$="TLRUDCHVOB  128 FORR=1TOEX:I\$=I\$*"-":NEXT  130 L\$=""!.L]\$=L\$*L\$*L\$*L\$*L\$*L\$*L\$*L\$*L\$*L\$*L\$*L\$*L\$*L	110	DIMA\$(B%,A),B\$(B%,A),C\$(B%,3)
113 DIMJ*(A),R*(300),V*(15) 115 FORA=0TODX:REARDG*(A,0):NEXT 121 C4*=CHR*(30):C8*=CHR*(29) 122 C0\$*=CHR*(30):C8*=CHR*(29) 125 E*=CHR*(20)*"[L]IC]IC]IC]IC]IC]IC]IC]IC]IC]IC]IC]IC]IC]	113 DIMJ*(A), R** 380), V**(15) 115 FORR=0TOD*: READG\$*(A,0): NEXT 121 C4\$=CHR\$*(38): (88\$=CHR\$*(29) 122 C0\$=CHR\$*(38)* 125 E\$=CHR\$*(28)*"[L]ICIIU]ICIICIICIICIICIICIICIICIICIICIICIICIICI		
121 C4\$=CHR\$(30):C8\$=CHR\$(29) 122 CQ\$=CHR\$(34) 125 E\$=CHR\$(20)+"[L]IRIEUJEDIECJEHIEVIE 0IEB]" 126 F\$="TLRUDCHVOB 128 FORR=1TOEX:I\$=I\$+"-":NEXT 130 L\$="""!L\$=L\$+L\$+L\$+L\$+L\$+L\$ 135 L6\$="""!K\$=L6\$+L6\$+"""[D]IE2 B]" 148 GOSUB7000:OPEN3,3:OPEN4,U 159 PRINTL64L64.64.64 155 IFIN=0THENPRINT"[V]PUT DATA TAPE IN TAPE #1":GOSUB2950:OPEN2,1,0  - PAGE 1 -	121 C4\$=CHR\$(30):C8\$=CHR\$(29)  122 C9\$=CHR\$(34)  125 E\$=CHR\$(20)*"[L]IRILUICDICCICHICVIC  OIRB]"  126 F\$="TLRUDCHVOB  128 FORR=1TOE::I\$=I\$+"-":NEXT  130 L\$=""":L\$=L\$+L\$+L\$+L\$+L\$+L\$+L\$  135 L6\$=""":K\$=L6\$+L6\$+""[D]IR  B]"  148 GOSUB7000:OPEN3,3:OPEN4,U  159 PRINTL6\$L6\$L6\$L6\$  155 IFIN=0THENPRINT"[V]PUT DATA TAPE IN  TAPE #1":GOSUB2950:OPEN2,1,0  - PAGE 1 -	113	DIMJ\$(A),R\$(300),V\$(15)
125 E\$=CHR\$(20)+"[L][R][U][D][C][H][U][D][C][H][U][D][C][H][U][D][C][H][U][D][C][H][U][D][C][H][U][D][C][H][U][D][C][H][U][D][C][H][U][D][C][H][U][D][C][H][U][D][C][H][U][D][C][H][U][D][C][H][U][D][C][H][U][D][C][H][U][D][D][C][H][U][D][D][C][H][U][D][D][C][H][U][D][D][C][H][U][D][D][C][H][U][D][D][C][H][U][D][D][C][H][U][D][D][C][H][U][D][D][C][H][U][D][D][C][H][U][D][D][C][H][U][D][D][C][H][U][D][D][D][D][D][D][D][D][D][D][D][D][D]	125 E\$=CHR*(20)+"[L][R][U][D][C][H][C][] 0][B]" 126 F\$="TLRUDCHYOB 128 FORR=1TOE%: [\$=1\$+"-":NEXT 130 L\$=" ":L\\$=L\$+L\$+L\$+L\$+L\$+L\$ 135 L6\$="":K\\$=L6\$+L6\$+L6\$+"[D][C] B]" 140 GOSUB7000: OPEN3, 3: OPEN4, U 150 PRINTL6\$L6\$L6\$L6\$ 155 IFIN=0THENPRINT"[V]PUT DATA TAPE IN TAPE #1": GOSUB2950: OPEN2, 1, 0  - PAGE 1 -	121	C4\$=CHR\$(30):C8\$=CHR\$(29)
126 F\$="TLRUDCHVOB 128 FORA=1TOZ: I\$=I\$+"-":NEXT 130 L\$=" ":L1\$=L\$+L\$+L\$+L\$+L\$ 135 L6\$=" ":K\$=L6\$+L6\$+" [D ]I Z B]" 148 GOSUB7000:OPEN3,3:OPEN4,U 159 PRINTL6\$L6\$L6\$L6\$ 155 IFIN=0THENPRINT"(V)PUT DATA TAPE IN TRPE #1":GOSUB2950:OPEN2,1,0  - PAGE 1 -  - FOLD-  PROGRAM: PROGRANAL 3/10/80  160 IFIN=1THENGOSUB1000 165 J=41P=-1:O=35:GOSUB3000 170 IFPT=0ANDU)3THENGOSUB7500 170 IFPT=0ANDU)3THENGOSUB7500 170 IFPT=0ANDU)3THENGOSUB7500 171 IFPT=0ANDU)3THENGOSUB7500 172 IFPT=0ANDU)3THENGOSUB7500 173 IFPT=0ANDU)3THENGOSUB7500 174 IFPT=0ANDU)3THENGOSUB7500 175 A\$="LISTING" 180 IFJ0B=0THENA\$="EXPANDED "+A\$:IFPT=0 HENM=1 195 :W\$="":Y\$="" 195 :W\$="":Y\$="" 195 :W\$="":Y\$="" 195 :W\$="":" 200 :C\$=\db\$ 210 :GETH2_\db*:IF\db\$=CHR\$<10>THEN210 220 IF\db\$=CHR\$<13>THENQ=0:GOTO400 230 P\$=P\$+U\$ 240 IF\db\$=CQ\$ANDQ=1THENQ=0:\db\$="":":GOTO29  250 IF\db\$=CQ\$ANDQ=1THENQ=0:\db\$="":GOTO290 270 IF\db\$="""THENGOSUB300 290 :V\$=V\$+V\$+U\$:GOTO200 290 :V\$=V\$+V\$+U\$:GOTO200 390 :NI=NI+1:IFJOD=1THENRETURN 310 \$\$=\$\$+P\$:Z=VRL(\$\$) 320 :IFVAL(P\$>)0THENP\$=MID\$(L\$+P\$,LENKS) TR\$<2>>V2:IFF=OTHENP\$= 330 IFLEN P\$X=FX*MTHENS60 350 P\$=LEFT\$(P\$,FX*M)+L\$+" "+MID\$(P\$,FX ************************************	126 F\$="TLRUDCHYOB 128 FORR=1TOE:: I\$=I\$+"-":NEXT 130 L\$=" ":L1\$=L\$+L\$+L\$+L\$+L\$ 135 L6\$=" ":K\$=L6\$+L6\$+" [D ]I 2 B]" 148 GOSUB7000: OPEN3, 3: OPEN4, U 159 PRINTL6\$L6\$L6\$L6\$ 155 IFIN=0THENPRINT"[V ]PUT DATA TAPE IN TAPE #1":GOSUB2950: OPEN2, 1, 0  - PAGE 1 -  - FOLD-  - FOLD-  - PROGRAM: PROGRAML 3/10/80  169 IFIN=1THENGOSUB1000 165 J=41P=-1: O=35: GOSUB3000 170 IFPT=0RNDU)3THENGOSUB7500 170 IFPT=0RNDU)3THENGOSUB7500 171 IFPT=0RNDU)3THENGOSUB7500 172 IFPT=0RNDU)3THENGOSUB7500 173 IFPT=0RNDU)3THENGOSUB7500 174 IFPT=0RNDU)3THENGOSUB7500 175 A\$="LISTING" 180 IFJS="":"\$="":V\$="" 195 :W\$="":"\$="":V\$="" 195 :W\$="":"\$="":V\$="" 195 :W\$=":"\$="":V\$="" 196 :C\$=W\$ 210 :GET#2, W\$: IFW\$=CHR\$(10)THEN210 220 IFW\$=CHR\$(13)THENG=0:GOTO400 230 P\$=P\$+U\$ 240 IFW\$=CQ\$THENG\$-ITHENG=0:W\$=":":GOTO29  250 IFW\$=CQ\$THENG\$-ITHENG=0:W\$=":":GOTO29 250 IFW\$=CQ\$THENG\$-ITHENG=0:W\$=":":GOTO29 250 IFW\$=C\$":"THEN210 280 IFW\$=":"THENGOSUB300 290 :V\$=V\$=V\$+W\$:GOTO200 290 :V\$=V\$+V\$+W\$:GOTO200 390 :NI=NI+1: IFJOB=1THENETURN 310 \$\$=\$\$+P\$:Z=V\$H.(\$\$) 320 :IFVAL(P\$>)0THENP\$=MID\$(L\$+P\$,LENKS TREX(Z)>42): IFF=6THENP\$=2 330 IFLEN(P\$)Z=FX*MTHENS60 350 P\$=LEFT\$(P\$,FX*M)+L\$+" "+MID\$(P\$,FX 4M+1): IFLEN(P\$)Z=FX*MTHENS60 350 P\$=LEFT\$(P\$,FX*M)+L\$+" "+MID\$(P\$,FX 4M+1): IFLEN(P\$)Z=FX*MTHENS60 350 P\$=LEFT\$(P\$,FX*M)+L\$+" "+MID\$(P\$,FX 4M+1): IFLEN(P\$)Z=FX*MTHENO60+1 IFFLEN(P\$)Z=X*MTHENO60+1	125	E\$=CHR\$(20)+"[LJ[RJ[U][D][C][H][V][
135 L\$=" ":L1\$=L\$+L\$+L\$+L\$+L\$ 135 L6\$=" ":K\$=L6\$+L6\$+" [D] IS B]" 148 GOSUB7000:OPEN3,3:OPEN4,U 150 PRINTL6\$L6\$L6\$L6\$L6\$ 155 IFIN=0THENPRINT"(V]PUT DATA TAPE IN TAPE #1":GOSUB2950:OPEN2,1,0  - PAGE 1	138 L\$=" ":L1\$=L\$+L\$+L\$+L\$+L\$+L\$ 135 L6\$=" ":K\$=L6\$+L6\$+" [D]E B]" 148 GOSUB7000:OPEN3,3:OPEN4,U 150 PRINTL6\$L6\$+C\$+C\$+C\$+C\$+C\$+C\$+C\$+C\$+C\$+C\$+C\$+C\$+C\$	126	F\$="TLRUDCHVOB
135 L6\$="":K\$=L6\$+L6\$+"[D]E2 B]" 146 GOSUB7000:OPEN3,3:OPEN4,U 159 PRINTL6\$L6\$L6\$L6\$ 155 IFIN=OTHENPRINT"(V)PUT DATA TAPE IN TRPE #1":GOSUB2950:OPEN2,1,0  - PAGE 1 -  - FOLD-  - FOLD	135 L6\$="":K\$=L6\$+L6\$+"[D]E2 B]" 148 GOSUB7000:OPEN3,3:OPEN4,U 159 PRINTL6\$L6\$L6\$L6\$ 155 IFIN=OTHENPRINT"(V]PUT DATA TAPE IN TAPE #1":GOSUB2950:OPEN2,1,0  - PAGE 1 -  - FOLD		
159 PRINTLG\$LG\$LG\$LG\$LG\$ 155 IFIN=0THENPRINT"[V]PUT DATA TAPE IN TRPE #1":GOSUB2950:OPEN2,1,0  - PAGE 1	159 PRINTLG\$LG\$LG\$LG\$LG\$LG\$ 155 IFIN=0THENPRINT"LY JPUT DATA TAPE IN TAPE #1":GOSUB2950:OPEN2,1,0  - PAGE 1		
- PAGE 1 FOLD	- PAGE 1 FOLD	150	PRINTL6\$L6\$L6\$L6\$
FOLD— PROGRAM: PROGRNAL 3/10/80  168 IFIN=1THENGOSUB1000 165 J=4;P=-1:0=35;GOSUB3000 176 IFPT=0ANDU/3THENGOSUB7500 176 IFPT=0ANDU/3THENGOSUB7500 176 IFPT=0ANDU/3THENGOSUB7500 176 IFPT=0ANDU/3THENGOSUB7500 176 IFDT=0ANDU/3THENGOSUB7500 180 IFJOB=0THENA*="EXPANDED "+A*:IFPT=0 181 IFJOB=0THENA*="EXPANDED "+A*:IFPT=0 185 GOSUB3200:GOSUB2990:A*="":TS=TI 190 :C*=\u00e41** 195 :\u00e4*="":"\$="":""":"	FOLD— PROGRAM: PROGRAML 3/10/80  168 IFIN=1THENGOSUB1000 165 J=4:P=-1:0=35:GOSUB3000 178 IFPT=0ANDU/3THENGOSUB7500 178 IFJT=0ANDU/3THENGOSUB7500 178 IFJT=0ANDU/3THENGOSUB7500 178 IFJT=0ANDU/3THENGOSUB7500 180 IFJDB=0THENA#="EXPANDED "+A\$:IFPT=0 185 GOSUB3200:GOSUB2990:A\$="":TS=TI 190 :P\$="":5\$="":V\$="" 195 :W\$="":" 195 :W\$="":" 196 :C\$=W\$ 210 :GET#2,W\$:IFW\$=CHR\$(10)THEN210 220 IFW\$=CHR\$(13)THENQ=0:GOTO400 230 P\$=P\$+U\$ 240 IFW\$=CQ\$ANDQ=1THENQ=0:W\$=":":GOTO29 0 250 IFW\$=CQ\$THENQ=1:GOTO195 260 IFW\$="!"THENGOSUB300 270 IFW\$="!"THENGOSUB300 290 :V\$=V\$+V\$+W\$:GOTO200 290 :V\$=V\$+W\$:GOTO200 300 :NI=NI+1:IFJOB=1THENETURN 310 \$\$=\$\$+P\$:Z=VRL(5\$) 320 :IFVAL(P\$>>0THENP\$="""HMID\$(P\$,FX 18**(Z)>42):IFF=0THENF=2 330 IFLEN(P\$)<=T**M*THENS60 340 P\$=LEFT\$(P\$,FX*M*)+L\$+""+MID\$(P\$,FX 48+1):IFLEN(P\$>=EX*M*)+L\$+""+MID\$(P\$,FX 48+1):IFLEN(P\$>=EX*M*)+L\$+""+MID\$(P\$,FX 48+1):IFLEN(P\$)=EX*M*THENS60 350 P\$=LEFT\$(P\$,EX*M*)+L\$+""+MID\$(P\$,EX 48+1):IFLEN(P\$)=EX*M*THENG000+1 :IFLEN(P\$)>EX*M*THENO00+1		
165 J=4;P=-1;0=35;GOSUB3060 170 IFPT=0ANDU)3THENGOSUB7500 175 A\$="LISTING" 180 IFJOB=0THENR\$="EXPANDED "+A\$:IFPT=0 THENM=1 185 GOSUB3200;GOSUB2990;A\$="":TS=TI 190 :P\$="";\$="";V\$="" 195 :W\$=":" 195 :W\$=":" 195 :W\$=":" 200 :C\$=\u00e4\u00e4 210 :GETH2_\u00e4:IFW\$=CHR\$(10)THEN210 220 IFW\$=CHR\$(13)THENQ=0;GOT0400 230 P\$=P\$+U\$ 240 IFW\$=CQ\$ANDQ=1THENQ=0;U\$=":":GOT029 0 550 IFW\$=CQ\$ANDQ=1THENQ=0;U\$=":":GOT029 250 IFW\$=CQ\$THENQ=1;GOT0195 260 IFW\$="!"HENGOSUB600;GOT0200 270 IFW\$<="!"THENGOSUB600;GOT0200 290 :V\$=V\$=V\$+U\$:GOT0200 300 :NI=NI+1:IFJOB=1THENRETURN 310 \$\$=\$\$+P\$:Z=VRL(5\$) 320 :IFVAL(P\$>>0THENP\$= IFVALSTURN  310 \$\$=\$\$+P\$:Z=VRL(5\$) 320 :IFVAL(P\$>>0THENP\$= IFVALSTURN  310 \$\$=\$\$+P\$:Z=VRL(5\$) 320 :IFVAL(P\$>>0THENP\$= IFVALSTURN  311 \$\$=\$\$+P\$:Z=VRH(P\$>)=THENGS0 320 P\$=LEFT\$(P\$,FX*M)+L\$+" "*MID\$(P\$,FX*M*H1):IFLENCP\$>=Z*MTHENS60 350 P\$=LEFT\$(P\$,FX*M)+L\$+" "*MID\$(P\$,FX*M*H1) 360 :PRINT#4,P\$:IFLENCP\$>>FX*MTHENO=0+1 :IFLENCP\$>>EX*MTHENO=0+1	165 J=4+P=-1:0=35:GOSUB3000 170 IFPT=0ANDU/3THENGOSUB7500 176 AF="LISTING" 180 IFJOB=0THENR4="EXPANDED "+A\$:IFPT=0 THENM=1 185 GOSUB3200:GOSUB2990:A\$="":TS=TI 190 :P\$="":S\$="":V\$="" 195 :W\$="":" 195 :W\$="" 196 :C\$=W\$ 190 :C\$=W\$ 190 :C\$=W\$ 190 :C\$=W\$ 190 :C\$=W\$ 190 :C\$=W\$ 190 :GETH2_W\$:IFW\$=CHR\$(10)THEN210 190 :GETH2_W\$:IFW\$=CHR\$(10)THEN210 190 :FW\$=CC\$ANDQ=1THENQ=0:W\$=":":GOTO29 190 :FW\$=CQ\$THENQ=1:GOTO195 190 :FW\$=CQ\$THENQ=1:GOTO200 190 :FW\$="!"THENGOSUB300 190 :V\$=V\$=V\$+W\$:GOTO200 190 :V\$=V\$=V\$+W\$:GOTO200 190 :V\$=V\$=V\$+W\$:GOTO200 191 :IFNI+1:IFJOB=1THENRETURN 190 :S\$=S\$+P\$:Z=VRL(S\$) 290 :IFVAL(P\$>>0THENP\$=" 290 :IFVAL(P\$>>0THENP\$=" 290 :IFVAL(P\$>>0THENP\$=" 291 :IFURP\$>(=F2*MTHEN360 292 :IFVAL(P\$>>0THENP\$=" 293 :IFLEN(P\$>(=F2*MTHEN360 294 :PSINT#4,P\$:IFLEN(P\$>>F2*MTHEN060 295 :PSINT#4,P\$:IFLEN(P\$>>F2*MTHEN060 296 :PRINT#4,P\$:IFLEN(P\$>>F2*MTHEN060+1 1:IFLEN(P\$>)E2*MTHEN060+1	PROGR	
165 J=4;P=-1;0=35;GOSUB3060 170 IFPT=0ANDU)3THENGOSUB7500 175 A\$="LISTING" 180 IFJOB=0THENR\$="EXPANDED "+A\$:IFPT=0 THENM=1 185 GOSUB3200;GOSUB2990;A\$="":TS=TI 190 :P\$="";\$="";V\$="" 195 :W\$=":" 195 :W\$=":" 195 :W\$=":" 200 :C\$=\u00e4\u00e4 210 :GETH2_\u00e4:IFW\$=CHR\$(10)THEN210 220 IFW\$=CHR\$(13)THENQ=0;GOT0400 230 P\$=P\$+U\$ 240 IFW\$=CQ\$ANDQ=1THENQ=0;U\$=":":GOT029 0 550 IFW\$=CQ\$ANDQ=1THENQ=0;U\$=":":GOT029 250 IFW\$=CQ\$THENQ=1;GOT0195 260 IFW\$="!"HENGOSUB600;GOT0200 270 IFW\$<="!"THENGOSUB600;GOT0200 290 :V\$=V\$=V\$+U\$:GOT0200 300 :NI=NI+1:IFJOB=1THENRETURN 310 \$\$=\$\$+P\$:Z=VRL(5\$) 320 :IFVAL(P\$>>0THENP\$= IFVALSTURN  310 \$\$=\$\$+P\$:Z=VRL(5\$) 320 :IFVAL(P\$>>0THENP\$= IFVALSTURN  310 \$\$=\$\$+P\$:Z=VRL(5\$) 320 :IFVAL(P\$>>0THENP\$= IFVALSTURN  311 \$\$=\$\$+P\$:Z=VRH(P\$>)=THENGS0 320 P\$=LEFT\$(P\$,FX*M)+L\$+" "*MID\$(P\$,FX*M*H1):IFLENCP\$>=Z*MTHENS60 350 P\$=LEFT\$(P\$,FX*M)+L\$+" "*MID\$(P\$,FX*M*H1) 360 :PRINT#4,P\$:IFLENCP\$>>FX*MTHENO=0+1 :IFLENCP\$>>EX*MTHENO=0+1	165 J=4+P=-1:0=35:GOSUB3000 170 IFPT=0ANDU/3THENGOSUB7500 176 AF="LISTING" 180 IFJOB=0THENR4="EXPANDED "+A\$:IFPT=0 THENM=1 185 GOSUB3200:GOSUB2990:A\$="":TS=TI 190 :P\$="":S\$="":V\$="" 195 :W\$="":" 195 :W\$="" 196 :C\$=W\$ 190 :C\$=W\$ 190 :C\$=W\$ 190 :C\$=W\$ 190 :C\$=W\$ 190 :C\$=W\$ 190 :GETH2_W\$:IFW\$=CHR\$(10)THEN210 190 :GETH2_W\$:IFW\$=CHR\$(10)THEN210 190 :FW\$=CC\$ANDQ=1THENQ=0:W\$=":":GOTO29 190 :FW\$=CQ\$THENQ=1:GOTO195 190 :FW\$=CQ\$THENQ=1:GOTO200 190 :FW\$="!"THENGOSUB300 190 :V\$=V\$=V\$+W\$:GOTO200 190 :V\$=V\$=V\$+W\$:GOTO200 190 :V\$=V\$=V\$+W\$:GOTO200 191 :IFNI+1:IFJOB=1THENRETURN 190 :S\$=S\$+P\$:Z=VRL(S\$) 290 :IFVAL(P\$>>0THENP\$=" 290 :IFVAL(P\$>>0THENP\$=" 290 :IFVAL(P\$>>0THENP\$=" 291 :IFURP\$>(=F2*MTHEN360 292 :IFVAL(P\$>>0THENP\$=" 293 :IFLEN(P\$>(=F2*MTHEN360 294 :PSINT#4,P\$:IFLEN(P\$>>F2*MTHEN060 295 :PSINT#4,P\$:IFLEN(P\$>>F2*MTHEN060 296 :PRINT#4,P\$:IFLEN(P\$>>F2*MTHEN060+1 1:IFLEN(P\$>)E2*MTHEN060+1	160	IFIN=1THENGOSUB1888
175 R\$="LISTING" 180 IFJDB=0THENR\$="EXPANDED "+A\$: IFPT=0 THENM=1 185 GOSUB3200:GOSUB2900:A\$="":TS=TI 190 :P\$="":5\$="":V\$="" 200 :C\$=\u00e4\u00e4":":P\$="":Y\$="" 200 :C\$=\u00e4\u00e4\u00e4":FW\$="CHR\$\u00e4(10)\u00e4\u00e40 230 P\$=P\$+\u00e4\u00e4\u00e40 230 P\$=P\$+\u00e4\u00e4\u00e40 230 P\$=P\$+\u00e4\u00e4\u00e40 230 P\$=P\$+\u00e4\u00e4\u00e40 230 P\$=P\$+\u00e4\u00e4\u00e40 230 P\$=P\$+\u00e4\u00e4\u00e40 230 IF\u00e4=\u00e4\u00e40\u00e40 230 IF\u00e4=\u00e4\u00e40\u00e40 250 IF\u00e4=\u00e4\u00e40\u00e40 250 IF\u00e4=\u00e4\u00e40\u00e40 250 IF\u00e4\u00e40\u00e40\u00e40 250 IF\u00e4\u00e40\u00e40\u00e40 250 IF\u00e4\u00e40\u00e40\u00e40 250 IF\u00e4\u00e40\u00e40\u00e40 250 IF\u00e4\u00e40\u00e40\u00e40 250 IF\u00e4\u00e40\u00e40\u00e40 250 IF\u00e40\u00e40\u00e40\u00e40 250 IF\u00e40\u00e40\u00e40\u00e40 250 IF\u00e40\u00e40\u00e40\u00e40\u00e40 250 P\$=LEFT\$\u00e40\u00e40\u00e40\u00e40\u00e40 250 P\$=LEFT\$\u00e40\u00e40\u00e40\u00e40\u00e40 250 P\$=LEFT\$\u00e40\u00e40\u00e40\u00e40\u00e40 250 P\$=LEFT\$\u00e40\u00e40\u00e40\u00e40 250 P\$=LEFT\$\u00e40\u00e40\u00e40\u00e40 250 P\$=LEFT\$\u00e40\u00e40\u00e40\u00e40 250 P\$=LEFT\$\u00e40\u00e40\u00e40\u00e40 250 P\$=LEFT\$\u00e40\u00e40\u00e40 250 P\$=LEFT\$\u00e40\u00e40\u00e40 250 P\$=\u00e40\u00e40\u00e40 250 IF\u00e40\u00e40 250 IF\u00e40\u00e40 250 IF\u00e40\u00e40 250 IF\u00e40\u00e40 250 IF\u00e40\u00e40 250 IF\u00e40 250 IF\u00e40\u00e40 250 IF\u00e40 250 IF\u00	175 A\$="LISTING" 180 IFJOB=0THENA\$="EXPANDED "+A\$:IFPT=0 IFLOM=-1 185 GOSUB3200:GOSUB2990:A\$="":TS=TI 190 :P\$="":S\$="":V\$="" 200 :C\$=\u00e4\$ 210 :GET\u00e42,\u00e4\$:IF\u00ft\u00e42=0:GOTO400 220 IF\u00e4=C\u00e4R\$(13)THENQ=0:GOTO400 230 P\$=P\$+\u00e4\u00e4 240 IF\u00e4=C\u00e4R\$(13)THENQ=0:\u00e4\$=":":GOTO29 0 250 IF\u00e4=C\u00e4R\$(13)THENQ=0:\u00e4\$=":":GOTO29 0 250 IF\u00e4\$=C\u00e4R\$(13)THENQ=0:\u00e4\$=":":GOTO29 250 IF\u00e4\$=C\u00e4\$THENQ=1:GOTO200 250 IF\u00e4\$=":"THENGOSUB300 250 IF\u00e4\$=":"THEN210 280 IF\u00e4\$=":"THEN210 280 IF\u00e4\$=":"THENGOSUB300 290 :\u00e4\$=\u00e4\$=\u00e4\$=\u00e4\$=\u00e4\$ 300 :\u00e4NI=\u00e41:IFUNE\u00e4\u00e4\$=\u00e4\u00e4\u00e4\$=\u00e4\u00e4\$=\u00e4\u00e4\$=\u00e4\u00e4\u00e4\$=\u00e4\u00	165	J=4:P=-1:0=35:G0SUB3000
180 IFJOB=0THENR4="EXPANDED "+R\$: IFPT=0 THENM=1 185 GOSUB3200: GOSUB2990: R\$="":TS=TI 190 :P\$="":S\$="":V\$="" 195 : W\$=":" 196 : C\$=!\delta 200 : C\$=!\delta 210 : GETW2_\delta: IF\delta=CHR\$\(10)\text{THEN210}\) 220 IF\delta=CHR\$\(13)\text{THENQ=0:GOTO400}\) 220 IF\delta=CU\$RNDQ=1THENQ=0:\delta=":":GOTO29 230 P\$=P\$+\delta 240 IF\delta=CO\$THENQ=1:GOTO195 250 IF\delta=CO\$THENQ=1:GOTO195 250 IF\delta=CO\$THENQ=1:GOTO200 270 IF\delta=":"THENGOSUB300 290 :V\$=V\$+\delta*:GOTO200	188 IFJOB=0THENR4="EXPANDED "+R\$: IFPT=8 THENM=1 185 GOSUB3200: GOSUB2990: R\$="":TS=TI 190 :P\$="":S\$="":V\$="" 195 :W\$=":" 196 :P\$="" 197 :W\$=":" 198 :P\$="" 198 :P\$=" 198 :P\$=		
185 GOSUB3200:GOSUB2900:A\$="":TS=TI 190 :P\$="":5\$="":V\$="" 200 :C\$=\u00e4\u00e	185 GOSUB3200:GOSUB2900:A\$="":TS=TI 190 :P\$="":S\$="":V\$="" 200 :C\$=\u00e4\u00e4":":Y\$=\u00e4" 210 :GET\u00e42,\u00e4\u00e4:IF\u00e4=CHR\u00e4(10)THEN210 220 !F\u00e4=CHR\u00e4(13)THENQ=0:GOTO400 230 P\$=P\$+\u00e4\u00e4(13)THENQ=0:\u00e4\u00e4=\u00e4:":GOTO29 250 !F\u00e4=CQ\$THENQ=1:HENQ=0:\u00e4\u00e4=\u00e4:":GOTO290 250 !F\u00e4=CQ\$THENQ=1:GOTO200 250 !F\u00e4=\u00e4=\u00e4\u00e4\u00e4\u00e4\u00e4\u00e4=\u00e4	180	IFJOB=@THENA\$="EXPANDED "+A\$:IFPT=@
195 : W\$=":" 200 : C\$=W\$ 210 : G\$=W\$; IFW\$=CHR\$ 10 ) THEN210 220 IFW\$=CHR\$</13 ) THENQ=0: GOTO400 230 P\$=P\$+W\$ 240 IFW\$=CQ\$ANDQ=1THENQ=0: W\$=":":GOTO29 8 250 IFW\$=CQ\$ANDQ=1: GOTO200 250 IFW\$=CQ\$THENQ=1: GOTO200 270 IFW\$<-"!"THENGOSUB600: GOTO200 270 IFW\$<-"!"THENGOSUB300 270 : V\$=V\$+W\$: GOTO200 270 : V\$=V\$+W\$: GOTO200 270 : V\$=V\$+W\$: GOTO200 270 : NI=NI+1: IFJOB=1THENRETURN 310 S\$=S\$+P\$: Z=VRL(S\$) 320 : IFVNL(P\$) 0THENP\$=MID\$ 230 IFUNC(P\$)>6THENP\$=3 330 IFLEN(P\$)<=F2*MTHEN360 340 P\$=LEFT\$ 350 P\$=LEFT\$	195 : W\$=":" 200 : C\$=W\$ 210 : GET#2; W\$: IFW\$=CHR\$(10)THEN210 220 IFW\$=CHR\$(13)THENQ=0:GOTO400 230 P\$=P\$+W\$ 240 IFW\$=CQ\$ANDQ=1THENQ=0:W\$=":":GOTO29 8 250 IFW\$=CQ\$ANDQ=1:GOTO195 260 IFQ=1THENGOSUB600:GOTO200 270 IFW\$(="!"THEN210 280 IFW\$="!"THENGOSUB300 290 :V\$=V\$+W\$:GOTO200 ****** 300 :NI=NI+1: IFJOB=1THENRETURN 310 \$\$=\$\$+P\$:Z=VAHC\$\$) 320 :IFVAL(P\$)>0*THENP\$=MID\$(L\$+P\$;LEN(\$) 320 :IFVAL(P\$)>0*THENP\$="ID\$(\$) 340 P\$=LEFT\$(P\$,F2*M*THEN360 350 P\$=LEFT\$(P\$,F2*M*THEN360 350 P\$=LEFT\$(P\$,F2*M*THEN360 350 P\$=LEFT\$(P\$,F2*M*THEN360 350 P\$=LEFT\$(P\$,F2*M*THEN360 350 P\$=LEFT\$(P\$,F2*M*THEN360)	185	GOSUB3200: GOSUB2990: A\$="": TS=TI
218 :GETW2,W\$:IFW\$=CHR\$(10)THEN218 220 IFW\$=CHR\$(13)THEN0=0:GOTO400 220 FW\$=CHR\$(13)THEN0=0:U\$=":":GOTO29 240 IFW\$=CO\$#ANDQ=1THENQ=0:U\$=":":GOTO29 250 IFW\$=CO\$#THENQ=1:GOTO195 260 IFW\$=CO\$#THENQ=1:GOTO200 270 IFW\$<="!"ITHENGOSUB300 290 :V\$=V\$+W\$:GOTO200 -**** 300 :NI=NI+1:IFJDS=ITHENRETURN 310 \$\$=\$\$+P\$:Z=VRL(\$\$) 320 :IFVA(P\$)>0THENP\$=MID\$(L\$+P\$,LENKS) TR\$(Z)>+2):IFF=0THENF=2 330 IFLEN P\$X=FX*MTHEN360 340 P\$=LEFT\$(P\$,FX*M)+L\$+" "*MID\$(P\$,FX*M)+1:IFLEN(P\$) <ex*mthen360 "*mid\$(p\$,ex*m)+1):iflen(p\$)*ex*mthen360="" "*mid\$(p\$,ex*m)+1):iflen(p\$)*ex*mtheno="0+1" 350="" :iflen(p\$)*ex*mtheno="0+1&lt;/td" p\$='LEFT\$(P\$,EX*M)+L\$+"'><td>210 :GET#2,W\$::IFW\$=CHR\$(10)THEN210 220 :IFW\$=CHR\$(13)THEN0=0:GOTO400 230 P\$=P\$+W\$ 240 :IFW\$=CO\$#ANDQ=1THENQ=0:W\$=":":GOTO29 8 250 :IFW\$=CO\$#ANDQ=1THENQ=0:W\$=":":GOTO29 250 :IFW\$=CO\$#THENQ=1:GOTO195 260 :IFW\$=":"THENGOSUB600:GOTO200 270 :IFW\$=":"THENGOSUB600 290 :V\$=V\$+W\$:GOTO200 -**** 300 :NI=NI+1::IFJOB=ITHENRETURN 310 \$\$=\$\$+P\$:Z=VFL(\$\$) 320 :IFVA(\$\$)&gt;0THENP\$=MID\$(L\$+P\$,LENK\$ 320 :IFVA(\$\$)&gt;0THENP\$=3 330 :IFLEN(\$\$)&gt;0THENP\$=3 330 :IFLEN(\$\$)&gt;0THENP\$=3 330 :IFLEN(\$\$)&gt;0THENP\$=3 330 :IFLEN(\$\$)&gt;0THENP\$=3 330 :FLET\$(\$\$,F2*M*)+L\$+" "*MID\$(\$\$,F2*M*)+1.*" "*MID\$(\$\$,F2*M*)+1.</td><td></td><td></td></ex*mthen360>	210 :GET#2,W\$::IFW\$=CHR\$(10)THEN210 220 :IFW\$=CHR\$(13)THEN0=0:GOTO400 230 P\$=P\$+W\$ 240 :IFW\$=CO\$#ANDQ=1THENQ=0:W\$=":":GOTO29 8 250 :IFW\$=CO\$#ANDQ=1THENQ=0:W\$=":":GOTO29 250 :IFW\$=CO\$#THENQ=1:GOTO195 260 :IFW\$=":"THENGOSUB600:GOTO200 270 :IFW\$=":"THENGOSUB600 290 :V\$=V\$+W\$:GOTO200 -**** 300 :NI=NI+1::IFJOB=ITHENRETURN 310 \$\$=\$\$+P\$:Z=VFL(\$\$) 320 :IFVA(\$\$)>0THENP\$=MID\$(L\$+P\$,LENK\$ 320 :IFVA(\$\$)>0THENP\$=3 330 :IFLEN(\$\$)>0THENP\$=3 330 :IFLEN(\$\$)>0THENP\$=3 330 :IFLEN(\$\$)>0THENP\$=3 330 :IFLEN(\$\$)>0THENP\$=3 330 :FLET\$(\$\$,F2*M*)+L\$+" "*MID\$(\$\$,F2*M*)+1.*" "*MID\$(\$\$,F2*M*)+1.		
220 IFW\$=CHR\$<(13)THENQ=0:GOTO400 230 P\$=P\$+U\$ 240 IFW\$=CQ\$ANDQ=1THENQ=0:W\$=":":GOTO29 0 250 IFW\$=CQ\$ANDQ=0:GOTO200 250 IFW\$=CQ\$THENQ=1:GOTO195 250 IFQ=1THENGOSUB600:GOTO200 270 IFW\$<="!"THEN210 280 IFW\$="!"THEN210 280 IFW\$=":"THENGOSUB300 290 :V\$=V\$+V\$+U\$:GOTO200  *****  300 :NI=NI+1:IFJOB=1THENRETURN 310 S\$=S\$+P\$:Z=VRL(S\$) 320 :IFVNL(P\$)>07HENP\$=MID\$(L\$+P\$,LEN(STR\$(Z))+2):IFF=0THENF=2 330 IFLEN(P\$)<=F2*MTHEN360 340 P\$=LEFT\$(P\$,F2*MTHEN360 340 P\$=LEFT\$(P\$,F2*MTHEN360 350 P\$=LEFT\$(P\$,F2*MTHEN360)	220 IFW\$=CHR\$<(13)THENQ=0:GOTO400 230 P\$=P\$+U\$ 240 IFW\$=CQ\$ANDQ=1THENQ=0:W\$=":":GOTO29 8 250 IFW\$=CQ\$THENQ=1:GOTO195 260 IFQ=1THENGOSUB600:GOTO200 270 IFW\$<="!"THENE210 280 IFQ\$="!"THENE210 280 IFW\$=":"THENE210 280 IFW\$=":"THENGOSUB300 290 :V\$=V\$+W\$:GOTO200  *****  300 :NI=NI+1:IFJOB=1THENRETURN 310 \$\$=\$\$+P\$:Z=VAL(\$\$) 320 :IFVAL(P\$)>0THENP\$=MID\$(L\$+P\$,LEN(\$TRX(Z))+2):IFF=0THENF=2 330 IFLEN(P\$)<=FX*MTHEN360 340 P\$=LEFT\$(P\$,FX*MTHEN360 350 P\$=LEFT\$(P\$,FX*MTHEN360 350 P\$=LEFT\$(P\$,FX*MTHEN360 350 P\$=LEFT\$(P\$,FX*MTHEN360)		:C\$=W\$
240 IFW\$=CQ\$ANDQ=1THENQ=0:W\$=":":GOTO29 0 250 IFW\$=CQ\$THENQ=1:GOTO195 260 IFQ=1THENGOSUB600:GOTO200 270 IFW\$<=""THEN210 270 IFW\$=""THEN210 270 IFW\$="""THEN210 270 IFW\$=""THEN210 270 IFW\$=""THEN210 270 IFW\$="THEN210 270 IFW\$="THEN2	240 IFW\$=CO\$ANDQ=1THENQ=0:W\$=":":GOTO29 0 250 IFW\$=CO\$THENQ=1:GOTO195 260 IFQ=1THENGOSUB600:GOTO200 270 IFW\$<=""THENEQOSUB600:GOTO200 270 IFW\$=":"THENGOSUB300 290 :V\$=V\$+W\$:GOTO200		
250 IFW\$=CQ\$THENQ=1:GOTO195 260 IFQ=1THENGOSUB600:GOTO200 270 IFW\$<=":"THEN210 280 IFW\$=":"THEN210 280 IFW\$=":"THENGOSUB300 290 :V\$=V\$=V\$+W\$:GOTO200 300 :NI=NI+1:IFJOB=1THENRETURN 310 \$\$=\$\$+P\$:Z=VRL(\$\$) 320 :IFVAL(\$\$)>000:IFF=0THENP\$=MID\$(L\$+P\$,LENKS) IFX(Z)>+2):IFF=0THENF=2 330 IFLEN(\$\$) 330 IFLEN(\$\$) 330 IFLEN(\$\$) 330 IFLEN(\$\$) 330 IFLEN(\$\$) 331 IFLEN(\$\$) 332 IFVEN(\$\$) 333 IFLET\$\$(\$\$,FZ**MTHEN360) 334 P\$=LEFT\$\$(\$\$,FZ**MTHEN360) 350 P\$=LEFT\$(\$\$,FZ**MTHEN360) 350 P\$=LEFT\$(\$\$,FZ**MTHEN360) 360 :PRINT\$\$4,P\$:IFLEN(\$\$)>FZ**MTHEN0=0+1 :IFLEN(\$\$)>EZ**MTHEN0=0+1	250 IFW\$=CQ\$THENQ=1:GOTO195 260 IFQ=1THENGOSUB600:GOTO200 270 IFW\$<-"!"THEN210 280 IFW\$=":"THEN210 280 IFW\$=":"THENGOSUB300 290 :V\$=V\$=V\$+W\$:GOTO200 300 :NI=NI+1:IFJOB=1THENRETURN 310 \$\$=\$\$+P\$:Z=VRL(\$\$) 320 :IFVAL(\$\$)\$ 321 :IFVAL(\$\$)\$ 322 :IFVAL(\$\$)\$ 323 :IFVAL(\$\$)\$ 324 :P\$=LEFT\$(\$\$;F2*MTHEN360 350 :P\$=LEFT\$(\$\$;F2*MTHEN360 350 :P\$=LEFT\$(\$\$;F2*MTHEN360 350 :P\$INT\$4,P\$:IFLEN(\$\$\$)\$F2*MTHEN0=0+1 :IFLEN(\$\$\$)\$E2*MTHEN0=0+1	220	:GET#2,W\$:IFW\$=CHR\$(10)THEN210 IFW\$=CHR\$(13)THENQ=0:GOTO400
270 IFW\$<="!"THEN210 280 IFW\$=":"THEN605UB300 290 :V\$=V\$+W\$:GOTO200  *****  300 :NI=NI+1:IFJ0B=1THENRETURN 310 S\$=S\$+P\$:Z=VPH_(S\$) 320 :IFVH_(P\$>>07THENP\$=MID\$(L\$+P\$,LEN(S)) 330 IFVH_(P\$>>07THENP\$=MID\$(L\$+P\$,LEN(S)) 330 IFLEN(P\$><=F>***********************************	270 IFW#<="!"THEN210 280 IFW#=":"THEN605UB300 290 :V*=V*+W*:GOTO200  *****  300 :NI=NI+1: IFJOB=ITHENRETURN 310 S\$=S\$+P\$:Z=VAL(S\$) 320 :IFVAL(P\$>>BTHENP\$=MID\$(L\$+P\$,LEN(S)) 320 :IFVAL(P\$>>BTHENP\$=MID\$(L\$+P\$,LEN(S)) 330 IFLEN(P\$><=FX*MTHEN360 340 P\$=LEFT\$(P\$,FX*M*)+L\$+" "+MID\$(P\$,FX*M*)+L\$+" "+MID\$(P\$,FX*M*)+L\$+" "+MID\$(P\$,EX*M*)+L\$+" "+MID\$(P\$,EX*M*)+IFLEN(P\$)>EX*MTHENO=O+1	220 230 240	:GET#2,W\$:IFW\$=CHR\$(10)THEN210 IFW\$=CHR\$(13)THENQ=0:GOTO400 P\$=P\$+W\$
280 IFW\$=":"THENGOSUB300 290 :V\$=V\$+V\$+W\$:GOTO200 ****** 300 :NI=NI+1:IFJOB=1THENRETURN 310 \$\$=\$\$+P\$:Z=VRL(\$\$) 320 :FV\$HUL(\$\$)**OTHENP\$=MID\$(L\$+P\$,LENKS) TR\$(Z)>+2):IFF=0THENF=2 330 IFLEN(P\$)<=F2*MTHEN360 340 P\$=LEFT\$(P\$,F2*M*)+L\$+" "+MID\$(P\$,F2*M*)+L\$+" "+MID\$(P\$,F2*M*)+L\$+" "+MID\$(P\$,F2*M*)+L\$+" "+MID\$(P\$,E2*M*)+L\$+" "+MID\$(P\$	280 IFW\$=":"THENGOSUB300 290 :V\$=V\$+U\$:GOTO200 ****** 300 :NI=NI+1:IFJOB=1THENRETURN 310 \$\$=\$\$+P\$:Z=VRL(\$\$) 320 :IFVAL(\$\$)***IFF=0THENF\$=Z 330 IFLEN(\$\$)***IFF=0THENF\$=Z 330 IFLEN(\$\$)***IFF=0THENF\$=Z 330 IFLEN(\$\$)***IFF=0THEN\$60 340 P\$=LEFT\$*(\$\$,F2*M*)+L\$**" "*MID\$(\$\$,F2*M*)+L\$**" "*MID\$(\$\$,F2*M*)+	220 230 240 0 250	:GET#2,W\$:IFW\$=CHR\$(10)THEN210 IFW\$=CHR\$(13)THENQ=0:GOTO400 P\$=P\$+W\$ IFW\$=CO\$ANDQ=1THENQ=0:W\$=":":GOTO29 IFW\$=CQ\$THENQ=1:GOTO195
**** 300 :NI=NI+1:IFJOB=ITHENRETURN 310 S\$=\$\$+P\$:Z=VFL(5\$) 320 :IFVRL(P\$)>0THENP\$=MID\$(L\$+P\$,LEN(5) 320 :IFVRL(P\$)>0THENP\$=MID\$(L\$+P\$,LEN(5) TREX(2)>+2):IFF=0THENF=2 330 IFLEN(P\$)<=F2**MTHEN360 340 P\$=LEFT\$(P\$,F2**M)*L\\$+" "*MID\$(P\$,F2**M*+1):IFLEN(P\$)<=E2**MTHEN360 350 P\$=LEFT\$(P\$,E2**M)*L\\$+" "*MID\$(P\$,E2**M*+1) 360 :PRINT#4,P\$:IFLEN(P\$)>F2**MTHEN0=0+1 :IFLEN(P\$)>E2**MTHEN0=0+1	**** 300 :NI=NI+1:IFJOB=ITHENRETURN 310 S\$=S\$+P\$:Z=VFL(S\$) 320 :IFVRL(P\$)>0THENP\$=MID\$(L\$+P\$,LEN(S TREX(Z)>+2):IFF=0THENF=Z 330 IFLEN(P\$><=F2*MTHENS60 340 P\$=LEFT\$(P\$,F2*M)+L\$+" "+MID\$(P\$,F2*M)+L\$+" "+MID\$(P\$,F2*M)+L\$+" "+MID\$(P\$,E2*M)+L\$+"	220 230 240 0 250 260	:GET#2,W\$:IFW\$=CHR\$(10)THEN210 IFW\$=CHR\$(13)THENQ=0:GOTO400 P\$=P\$+W\$ IFW\$=CQ\$ANDQ=1THENQ=0:W\$=":":GOTO29 IFW\$=CQ\$THENQ=1:GOTO195 IFQ=1THENGOSUB600:GOTO200
316 \$\$=\$\$+P\$:Z=VRL(\$\$) 320 :IFVRL(P\$>>0THENP\$=MID\$(L\$+P\$,LENK\$ TR\$(Z)>+2):IFF=0THENP\$= 330 IFLEN(P\$)X=F2*MTHEN360 340 P\$=LEFT\$(P\$,F2*M)+L\$+" "+MID\$(P\$,F2*M)+L\$+" "+MID\$(P\$,F2*M)+L\$+" "+MID\$(P\$,F2*M)+L\$+" "+MID\$(P\$,E2*M)+L\$+" "+MID\$(P\$,E2*M)	316 \$\$=5\$+P\$:Z=VPL(\$\$) 320 :IFVRL(P\$>>8THENP\$=MID\$(L\$+P\$,LENK\$ TR\$X(Z)>+2):IFF=GTHENP\$=Z 330 IFLENCP\$>X=F2*MTHENS60 340 P\$=LEFT\$(P\$,F2*M)+L\$+" "+MID\$(P\$,F2*M)+1):IFLENCP\$>C=Z*MTHENS60 350 P\$=LEFT\$(P\$,E2*M)+L\$+" "+MID\$(P\$,E2*M)+L\$+" "+MID\$(P\$,E2*M)+L\$+" "*MID\$(P\$,E2*M)+L\$+" "*MID\$(P	220 230 240 0 250 260 270 280	:GET#2,W#:IFW#=CHR#(10)THEN210 IFW#=CHR#(13)THENQ=0:GOT0400 P#=P#+U# IFW#=CQ#RNDQ=1THENQ=0:W#=":":GOT029 IFW#=CQ#THENQ=1:GOT0195 IFQ=1THENGGSUB600:GOT0200 IFW#="!"THENEGSUB600 IFW#="!""THENEGSUB600
320 : IFVRL(P\$>>0THENP\$=MID\$(L\$+P\$,LENKS TRE%(Z)>+2): IFF=0THENF=Z 330	320 : IFVAL(P\$>>0THENP\$=MID\$(L\$+P\$,LENKS TRE%(Z)>+2): IFF=0THENF=Z 330	220 230 240 0 250 260 270 280	:GET#2,W#:IFW#=CHR#<10 )THEN210 IFW#=CHR#<137HENQ=0:GOT0400 P\$=P\$+U\$ IFW#=CQ#ANDQ=1THENQ=0:W#=":":GOT029  IFW#=CQ#THENQ=1:GOT0195 IFQ=1THENGOSUB600:GOT0200 IFW#<="!"THEN210 IFW#=":"THEN210 !V#=V#+W#:GOT0200
330 IFLEN(P\$)<=F%*MTHEN360 340 P\$=LEFT%(P\$,F%*M)*L\$*" "+MID\$(P\$,F% *M*+1): IFLEN(P\$)<=E%*MTHEN360 350 P\$=LEFT%(P\$,E%*M)*L\$*" "+MID\$(P\$,E% *M*+1) 360 :PRINT#4,P\$: IFLEN(P\$)>F%*MTHEN0=0+1 :IFLEN(P\$)>E%*MTHEN0=0+1	330 IFLEN(P\$)<=FX*MTHEN360 340 P\$=LEFT\$(P\$,FX*M)*LL\$+" "+MID\$(P\$,FX*M)*L1\$+" "+MID\$(P\$,FX*M)*L1\$+" "+MID\$(P\$,EX*M)*L1\$+" "+MID\$(P\$,EX*M)*L1\$+" "+MID\$(P\$,EX*M)*L1\$+" "+MID\$(P\$)EX*M)*L1\$+" "+MID\$(P\$)EX*M)*L1\$+" "+MID\$(P\$)EX*M)*L1\$+" "+MID\$(P\$)EX*M*M*L1) 360 :PRINT#4,P\$:IFLEN(P\$)EX*MTHEN0=0+1 :IFLEN(P\$)EX*MTHEN0=0+1	220 230 240 0 250 260 270 280 290	:GET#2, W#: IFW#=CHR#(10)THEN210 IFW#=CHR#(13)THEN0=0:GOT0400 P#=P#+W# IFW#=CQ#RNDQ=1THENQ=0:W#=":":GOT029 IFW#=CQ#THENQ=1:GOT0195 IFQ=1THENGGSUB600:GOT0200 IFW#="!"THEN210 IFW#=":"THENGGSUB300 :V#=V#+W#:GOT0200 :NI=NI+1:IFJ0B=1THENRETURN
348 P\$=LEFT\$(P\$,F%*M)+L\$+" "+MID\$(P\$,F% **M+1):IFLEN(P\$)X=E%*MTHEN3G8 350 P\$=LEFT\$(P\$,E%*M)+L\$+" "+MID\$(P\$,E% **M+1) 360 :PRINT#4,P\$:IFLEN(P\$)>F%*MTHEN0=0+1 :IFLEN(P\$)>E%*MTHEN0=0+1	348 P\$=LEFT\$(P\$,F%*M)+L\$+" "+MID\$(P\$,F% **M+1): IFLEN(P\$)<=E%*M*HEN3G8 350 P\$=LEFT\$(P\$,E%*M)+L\$+" "+MID\$(P\$,E% **M+1) 360 :PRINT#4,P\$: IFLEN(P\$)>F%*MTHEN0=0+1 :IFLEN(P\$)>E%*MTHEN0=0+1	220 230 240 0 250 260 270 280 290 300 310 320	:GET#2,W#:IFW#=CHR#<10 >THEN210 IFW#=CHR#<13 >THENQ=0:GOT0400 P#=C#### IFW#=CQ#FHENQ=1:HENQ=0:W#=":":GOT029  IFW#=CQ#FHENQ=1:GOT0195 IFQ=1THENGOSUB600:GOT0200 IFW#<="!"THEN210 IFW#=":"THEN210 IFW#=:":"THEN210 IFW#=:":"THEN2200 IFW#=:":"THENETURN S#=S#+P#:Z=V#I(S#) :IFV#I(S#)*LEN(S#) IFV#I(S#)*LEN(S#)
350 P\$=LEFT\$(P\$,E%*M)+L\$+" "+MID\$(P\$,E% *M+1) 360 :PRINT#4,P\$:IFLEN(P\$)>F%*MTHENO=O+1 :IFLEN(P\$)>E%*MTHENO=O+1	350 P\$=LEFT\$(P\$,E%*M)+L\$+" "+MID\$(P\$,E% *M+1) 360 :PRINT#4,P\$:IFLEN(P\$)>F%*MTHENO=O+1 :IFLEN(P\$)>E%*MTHENO=O+1	220 230 240 0 250 260 270 280 290 310 320 TR\$	:GET#2, W#: IFW#=CHR#(10)THEN210 IFW#=CHR#(13)THENQ=0:GOT0400 P#=P#+U# IFW#=CQ#ANDQ=1THENQ=0:U#=":":GOT029 IFW#=CQ#ANDQ=1THENQ=0:U#=":":GOT029 IFW#=CQ#THENQ=1:GOT0195 IFW#="THENGOSUB600:GOT0200 IFW#=":"THENGOSUB600:GOT0200 IFW#=":"THENGOSUB600 :V#=V#+U#:GOT0200 :V#=V#+U#:GOT0200 :V#=V#+U#:GOT0200 :NI=NI+1:IFJ0B=1THENRETURN S#=S\$+P#:Z=VPL(S#) IFVAL(P#>>0THENP#=MID#(L#+P#,LEN(S*)>+2):IFF=OTHENP=
360 :PRINT#4,P\$:IFLEM(P\$)>F%*MTHEN0=0+1 :IFLEM(P\$)>E%*MTHEN0=0+1	360 :PRINT#4,P\$:IFLEM:P\$>>F%*MTHEN0=0+1 :IFLEM:P\$>>E%*MTHEN0=0+1	220 230 240 0 250 260 270 280 290 300 310 320 TR\$<2 330 340	:GET#2,W#:IFW#=CHR#<10 )THEN210 IFW#=CHR#<13)THENQ=0:GOT0400 P#=P#+U# IFW#=CQ#FNDQ=1THENQ=0:W#=":":GOT029  IFW#=CQ#FNDQ=1THENQ=0:W#=":":GOT029  IFW#=CQ#THENQ=1:GOT0195 IFQ=1THENGOSUB600:GOT0200 IFW#<="!"THEN210 IFW#=":"THEN210 IFW#=":"THEN210 IFW#=":"THEN210 IFW#=":"THENGOSUB300 ***** **** **** **** **** **** ****
		220 230 240 0 250 260 270 290 300 310 320 340 *M+1;	:GET#2,W#:IFW#=CHR#(10)THEN210 IFW#=CHR#(13)THENQ=0:GOT0400 P\$=P\$+U\$ IFW#=CQ#ANDQ=1THENQ=0:W\$=":":GOT029  IFW#=CQ#THENQ=1:GOT0195 IFQ=1THENGOSUB600:GOT0200 IFW#<="!"THEN210 IFW#=""THENGOSUB300 :V\$=V\$+W\$:GOT0200  *****  **** **** **** **** **** *
- PAGE 2 -	- PAGE 2 -	220 230 240 0 250 260 270 280 290 310 320 TR*<2 330 340 *M+1) 350 *M+1)	:GET#2, W#: IFW#=CHR#C10 ) THEN210 IFW#=CHR#C13 ) THEN0=0:GOT0400 P#=P#+U# IFW#=CQ#ANDQ=1THENQ=0:W#=":":GOT029  IFW#=CQ#THENQ=1:GOT0195 IFQ#=1THENGOSUB800:GOT0200 IFW#=C#!THENGOSUB800:GOT0200 IFW#=":"THEN210 IFW#=":"THENGOSUB800 :V#=V#+U#:GOT0200
		220 230 240 0 250 260 270 280 290 310 320 TR*<2 330 340 *M+1) 350 *M+1)	:GET#2, W#: IFW#=CHR#C10 ) THEN210 IFW#=CHR#C13 ) THEN0=0:GOT0400 P#=P#+U# IFW#=CQ#ANDQ=1THENQ=0:W#=":":GOT029  IFW#=CQ#THENQ=1:GOT0195 IFQ#=1THENGOSUB800:GOT0200 IFW#=C#!THENGOSUB800:GOT0200 IFW#=":"THEN210 IFW#=":"THENGOSUB800 :V#=V#+U#:GOT0200
		220 230 240 0 250 260 270 290 300 310 320 TR\$300 310 320340 340 350350 4M+1) 360	:GET#2,W#:IFW#=CHR#C10)THEN210 IFW#=CHR#C13)THEN0=0:GOT0400 P\$=P\$+U4 IFW#=CQ#RNDQ=1THENQ=0:W\$=":":GOT029 IFW#=CQ#RNDQ=1THENQ=0:W\$=":":GOT029 IFW#=CQ#THENQG=1:GOT0195 IFW#=C##CHR#C10 IFW#="!"THENGOSUB300 IFW#="!"THENGOSUB300 :V#=V#+W#:GOT0200 -**** :NI=NI+1:IFJOB=1THENRETURN S#=S\$+P\$:Z=VRL(S\$) :IFV#L(P\$>>0FTHENP=#ID#CL\$+P\$,LENCS :>>+2>:IFF=6THENF=2 IFLENCP\$>(=F\$*MTHEN360 P\$=LEFT\$(P\$,F2*MTHEN360 P\$=LEFT\$(P\$,E2*MTHEN360 P\$=LEFT\$(P\$,E2*MTHEN360 P\$=LEFT\$(P\$,E2*MTHEN360 P\$=LEFT\$(P\$,E2*MTHEN360 P\$=LEFT\$(P\$,E2*MTHEN360) P\$=LEFT\$(P\$,E2*MTHEN360) P\$=LEFT\$(P\$,E2*MTHEN360)

Example 1. Sample Proganal output.

PROGR	RAM:		PROGANA	L 3/10/
ed String	<<< STRI	NG VARIAB	LES >>>	
W\$	7370 8020			
W\$	8060 8110			
100 50		40.00-		1070
X\$ X\$	500 710 7 1300 1320			
X\$	8090 8110			3000
Y\$	700 740 7		0 1270	1310
Y\$	1330 1350			
Z\$	1570 1700	1640 165	0.0100	0120
	1570 1620 8150 8180		0 8120	8130
	0100 0100	OLJO		
	/// NIME	**** RIC ARRAY	C 111	
		NONE-	3 ///	
		****		
	<<< STRII	NG ARRAYS	>>>	
A\$(	110 2110	2240 6030	6050	
B\$(	110 2120 :	2250 6130	6150	
·C\$(	110 2140 ;	2270 6230	6250	
D\$(	111 2150	2280 6330	6350	
E\$(	111 2130	2260 6430	6450	
F\$(	111 930 6	645		
CUT	111			NCUT
PROGR	AM:		PROGRNA	L 3/19/
	CCC MAICUR	MONICS >>	,	
24	LEFT\$(			LET
2	LIST	LOAD		LOGC
42	MID\$(	3 ON	35	NEXT
	HOT	3 0N	6	OPEN
	OR	S PEEK		POKE
		14 PRINT		READ
	REM RIGHT\$(	1 RESTOR	KE 57	RUN
	SAVE .	SGNC		SINC
	SPC(	SQRC		STEP
		27 STR\$0		SYS
	TABC	TANC		THEN
33		USRC	37	VALC
Profession of	VERIFY	WAIT		UNKNOW
	/// ppour	****	TIOUS :	
		H INSTRUC	2110NS 2	""
	90 400 410			
	95 250 520 90 260 290			
	10 210 270			
	90 240			
	30 280			
3	20 440			
	60 330 340			
	30 220			
	70 440 50 420 500			
	50 420 500 30 260			
	30 610 128	10		
ROGRE	AM:	,	PROGANAL	3/19/8
	<<< ANALA			
	PROGRAM L		(0090)	
1433	INSTRUCTI TOTAL VAR			
92	VARIABLE			
533				
192	LOGIC DEC			
2//	RELATIVE	LIMPLEYTT	V	

RELATIVE COMPLEXITY

MINUTES TO PROCESS: 129,783056

over two hours to analyze 500 program lines. But with unlimited computer time on your own system, why worry about running time?

Proganal was written with an original 8K PET with new ROMs, a 32K Expandapet and an Axiom EX-801 printer connected to a TNW-2000 interface. Several examples of what you can expect as output are shown in Example 1. For more information, send a self-addressed, stamped envelope to Benson Greene. He provides copies on tape with documentation for \$10.

### Paper-Mate Command 60

Several months ago, AB Computers of Montgomeryville, PA, announced its Paper-Mate Command 60 word processor package for the PET. Written by Michael Riley, this package is an interesting program at a selling price of only \$29. It incorporates full-screen editing with graphics for all 16K or 32K PETs, with tape or disk drives and any printer. It includes many features of the Commodore Word Pro 3 word processor, plus several new fea-

Written in BASIC, Paper-Mate is slower than Word Pro 3. Since Word Pro 3 is written in machine language, it can keep up with even the fastest typist when entering text. However, you must watch your typing speed with Paper-Mate, or you will overrun the BASIC input buffer. On the other hand, Paper-Mate can easily be modified or customized to suit your specific taste. The documentation even includes a brief program outline and a list of all BASIC variables used by the program.

For writing text, Paper-Mate has a definable keyboard, so you can use it with either business or graphics machines. You can even use your graphics keyboard in a business keyboard mode, where the top row of keys produces numbers, and the semicolon key produces a period. This makes typing with the graphics keyboard much smoother and faster. Another nice feature is a shift lock for letters only, or you can use the normal keyboard shift lock.

Text-editing features include floating cursor, scroll up or down, page forward or back and repeating insert and delete keys. Text block handling includes transfer, delete, append, save, load and insert. The editing features are not as outstanding as those in Word Pro 3, but they get the job done.

All formatting commands are embedded in the text for complete control, but commands must be entered on a separate line. Paper-Mate's commands include margin control and release, column adjust, nine tab settings, variable line spacing, text justification, text centering and auto print form letters (variable blocks). Files can be linked so that one command prints an entire manuscript. Auto paging, page headers, page numbers, pause at end of page and hyphenation pauses are also included. The hyphenation pause gives you the option of either placing the separating hyphen in a long word that overflows a line or keeping the entire word intact on the next line.

With this word processor, you can use PET graphics, as well as text. It can send any specific ASCII code to the printer. This allows multiple-expanded print on a Commodore 2022/ 2023 printer, something that Word Pro 3 does not support.

The following examines several features provided by Word Pro 3 but not supported by Paper-Mate, or provided in a limited manner.

- 1. You cannot display the disk directory if you are using a CBM 2040 disk for file storage. However, you can send any other command to the 2040 disk over the disk command channel.
  - 2. There are no search or replace features.
- 3. Page numbers must be at the bottom of the page. They cannot be selectively used in headings, text, etc.
- 4. Only a single page heading is generated, centered on the top of the page. Word Pro 3 allows left, middle and right fields within the heading-each positioned accordingly in the heading line.
- 5. You cannot combine commands on a single line; each Paper-Mate command must be on a separate line.
- 6. When editing text, you must use the cursor up/down keys to move from line to line. The cursor left/right keys do not wrap from line to line, as in the Word Pro 3.

The Paper-Mate program is a good, usable word processor for the occasional user, considering its lower cost. However, I still recommend Word Pro 3 for anyone requiring extensive controls and fast response.

### **Light Pen Programs**

In a recent column I mentioned Quill Software of 2512 Roblar Lane, Santa Clara, CA 95051, as a source of programs for use with the 3G Light Pen. They currently offer six different tapes, each with two programs.

Swords and Sorcery-An adventure game using the light pen to fight trolls, find gold, etc. An extensive version that barely fits in 8K. A separate introduction program uses plenty of graphic effects to explain general tactics.

Darth Vader and Hunt the Wumpus-Locate Darth Vader with your laser light beam or hunt the Wumpuses in a much handier fashion.

Laser Shoot and Light Pen Keyboard-In Laser Shoot, you point at a moving cursor to fire at various targets. It's complete with sound effects as well as graphics. The other program draws a replica of the PET keyboard for use as an excellent light pen demo.

Othello and Owari-Play against the computer using the light pen to select your moves.

Quill Quiz—Multiple-choice quizzes to test your knowledge of states/capitals, Spanish/ English, vocabulary and historical dates/

Billiards and Hangman-Play billiards using the light pen as the cue. In Hangman, use the light pen to save the victim or watch him climb the scaffold and hang.

Quill Quiz is one of the best quiz-type programs I've seen. Answers are selected by simply pointing the light pen at a flashing box next to the answer. You can even select the number of choices (up to ten). You can also determine the question-answer format. For example, choose the state that matches a given capital, or choose

the capital that matches the given state.

This program looks as if it could easily be changed to provide quizzes for new topics. All the data is contained in DATA statements, and the program itself is very straightforward.

Each tape sells for \$20, plus \$1.50, handling. Be sure to specify whether your system has the old or new ROMs.

### **CMS Business Software**

Over the past several months I've thoroughly tested a business software package from Chuck Stuart at CMS Software Systems (5115 Menefee Drive, Dallas TX 75227). The series of four program packages—General Ledger, Accounts Payable, Accounts Receivable and Payroll-is structured around the time-tested and proven series of business software systems developed by Osborne and Associates. The programs provided by CMS are designed to fill the need for a comprehensive accounting package for the PET. Each program can either stand alone or be integrated with the others in a total software system, depending on your needs.

Designed with the first-time user in mind, the programs lead the operator through verified data entry, step by step. It is impossible to crash a program due to operator error or invalid data input. Design consistency has been maintained from program to program to greatly increase operator familiarity and confidence.

Documentation-normally a problem for small-systems users-is provided by the comprehensive series of Osborne and Associates user manuals. These three manuals total over 800 pages of detailed step-by-step instructions written at three levels for DP department managers, data entry operators and programmers. A second set of manuals details any operations not covered in the Osborne manuals and any program changes made during conversion to the Commodore system. Each program is provided on disk with complete documentation packaged in a handsome, three-ring binder.

The features of the four packages include:

### General Ledger

- holds up to 300 accounts.
- accepts up to 3000 transactions per month. includes cash disbursements, cash receipts and petty cash journals for simplified data en-
- maintains account balances for the present month, quarter and year, as well as for three previous quarters and the previous year.
- includes complete financial reports, including trial balance, balance sheet, profit and loss statement, cash receipts journal, cash disbursements journal, petty cash journal and more.
- accepts postings from external sources such as the Accounts Payable, Accounts Receivable and Payroll packages. Price is \$295.

### **Accounts Payable**

- automatic application of credit and debit memos.
- maintains complete purchase records for up to 200 vendors.
- invoice file accepts up to 400 invoices.
- random-access file organization allows fast, individual, record updating.
- multiple reports provide a complete audit

trail.

- check printing with full invoice detail.
- full invoice aging.
- automatic posting to general ledger. Price is

### **Accounts Receivable**

- maintains invoice file for up to 300 invoices.
- · accommodates full or partial invoice pay-
- customer file maintains purchase information for up to 1000 customers.
- allows automatic progress billing.
- provides for credit and debit memos, as well as invoices.
- prints individual customer statements.
- automatic posting to General Ledger. Price is \$195.

### Payroll

- maintains monthly, quarterly and yearly cumulative totals for each employee.
- payroll check printing with full deduction and pay details.
- sixteen different reports, including W2 and 941 forms.
- complete job costing option with cumulative totals and overhead calculations.
- random-access file organization for fast updating of individual records.
- automatic posting to General Ledger. Price is \$350.

After using the General Ledger package in a real-life application for several months, I can say this is one of the best packages I've tried. The programming includes many built-in features and options too numerous to delineate.

If you have a sound interface, the program can provide an error warning signal or a short beep whenever a key is struck (audio verification). Along with the main programs of the package, several disk utilities are included for disk copying, erasing (scratching) account files or zeroing account totals.

CMS provides an update service that allows you to return your original program disk and receive a copy of the latest version for a small handling charge. If necessary, you'll also receive any utility programs required to update your active disks without disturbing the accounting data.

CMS Software also offers several elaborate game programs for the 16K PET: Baccarat, Backgammon, Blackjack, Checkers, Craps, Cribbage, Go Moku, Othello, Quibic 4, Roulette and Space Invaders. Backgammon and Space Invaders cost \$9.95 each; all other programs are \$7.95 each.

### Low-Cost Software

Russell Grokett, in cooperation with the Jacksonville Area PET Society, has made available a large amount of low-cost software for the PET computer. Included are games, finance, ham radio, astronomy, music, graphics and utility programs. Also being added are four-voice music and visible memory graphics programs. Most programs are available for only \$1.50 each, plus a small postage fee. Send an SASE to PET Library, 401 Monument Rd. #123, Jacksonville, FL 32211, for a three-page list of the programs available.

Programmatics Software, 71 Sargent Ave.,

Hex -	Decimal	Purpose
 E000	57344	Initialize editor
E003	57347	Get a key, return in A
E006	57350	Input a line
E009	57353	Print a character in A
E00C	57356	Interrupt handler
E00F	57359	Time update & keyboard scan
E012	57362	Interrupt exit
E015	57365	Clear screen
E018	57368	Set text mode, upper/lower case display
E01B	57371	Set graphic mode, upper case/graphics displa
E01E	57374	Set CRT controller
E021	57377	Scroll screen down 1 line
E024	57380	Scroll screen up 1 line
E027	57383	Scan keyboard
E02A	57386	Rins bell
E02D	57389	Set repeat flas
E030	57392	Set top left limit of scroll window
E033	57395	Set bottom right limit of scroll window

Providence, RI 02906, has also announced a list of software available for the PET. Many of the game programs use joysticks, and a parts kit will be available to build a simple interface for the PET. Other programs include a Billboard program with one-inch high characters and input editing, controlled scrolling speed, etc.

I just released several programs of my own. If interested in a list of PET programs and/or products, send an SASE to Baker Enterprises, 15 Windsor Dr., Atco, NJ 08004.

### **Short Notes**

Back in March the premiere of the new variety show "Pink Lady" featured a Commodore PET as a graphic device during a sequence by the musical group Blondie. A real-time spectrum analyzer was used to translate the musical tones onto the screen, displayed as a fluctuating bar graph. As far as anyone knows, this was the television debut of the Commodore PET.

An article in the March 17 issue of Computerworld described a specially adapted PET that is being used by a gifted, but spastic,

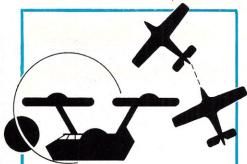
14-year-old boy in Dublin, Ireland. The young poet suffers from severe athetoid cerebral palsy. He is unable to speak and has almost no control of his movements. With the aid of the PET and specially prepared software, he can now write, select, reread and edit his literary material. Commands to the system are entered using his chin or knees and specially designed switches.

LRC, Inc., of Riverton, WY, has announced a new printer for the PET for under \$400. The model 7000 + provides 40 characters per line with a print speed of 1.25 lines per second. An available option provides 64 characters per line. This impact printer uses standard, low-cost roll

One of our readers passed on this word of caution: If you order an Excel printer, be sure the unit has been tested. A printer received back in February apparently had an incorrect ROM set and printed in Kata Kana, Japanese phonetic characters. I should mention, however, that Excel promptly refunded the money for the unit when it was returned.

A list of screen editor system calls for anyone with a new 8016 or 8032 CBM with version 4, disk BASIC is shown in Example 2.

## Natural Organic Apple Software Educational, intriguing and challenging...naturally!



### Apple Fun

We've taken five of our most popular programs and combined them into one tremendous package full of fun and excitement. This disk-based package now offers you these

Mimic - How good is your memory? Here's a chance to find out! Your Apple will display a sequence of figures on a 3×3 grid. You must respond with the exact same sequence, within

There are five different, increasingly difficult versions of the game, including one that will keep going indefinitely. Mimic is exciting, fast paced and challenging – fun for all!

Air Flight Simulation – Your mission is to take

off and land your aircraft without crashing. You're flying blind: on instruments only.

You start with a full tank of fuel, which gives you a maximum range of approximately 50 miles. The computer will constantly display updates of your air speed, compass heading and altitude. Your most important instrument is the Angle of Ascent/Bank Indicator. It will tell if the plane is climbing or descending and whether banking into a right of left turn.

After you've acquired a few hours flying time, you can try flying a course against a map or doing aerobatic maneuvers. Get a little more flight time under your belt and the sky's the limit!

Colormaster - Test your powers of deduction as you try to guess the secret color code in this Mastermind-type game. There are two levels of difficulty, and three options of play to vary your games. Not only can you guess the computer's color code, but it will guess yours! It will also serve as referee in a game between two human opponents. Can you make and break the color

Star Ship Attack - Your mission is to protect our orbiting food station satellites from destruction by an enemy star ship. You must capture, destroy or drive off the attacking ship. If you fail, our planet is doomed.

Trilogy - This exciting contest of logic has its origins in the simple game of tic-tac-toe. The object of the game is to place three of your colors in a row into the delta-like, multi-level display. The rows may be horizontal, vertical, diagonal and wrapped around, through the "third dimension". Your Apple (or human opponent) will be trying to do the same, and there are many paths to victory. You can even have your Apple play against itself!

Minimum system requirements are an Apple II or Apple II Plus computer with 32K of memory and one minidisk drive. Mimic requires Applesoft in ROM, all others run in RAM or ROM Applesoft.

Order No. 0161AD \$19.95

### Paddle Fun

This new Apple disk package requires a steady eye and a quick hand at the game paddles! We've included four different games to challenge and amuse you. They include:

Invaders - You must destroy an invading fleet of 55 flying saucers while dodging the carpet of bombs they drop. Keep a wary eye for the mother ship directing the incursion. Your bomb shelters will help you - for a while. Our version of a well known arcade game! Requires Applesoft in ROM.

Howitzer - This is a one or two person game in which you must fire upon another howitzer position. This program is written in HIGH-RESOLUTION graphics using different terrain and wind conditions each round to make this a demanding game. The difficulty level can be altered to suit the ability of the players. Requires Applesoft in ROM.

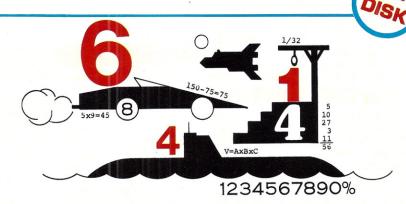
Space Wars - This program has three parts: (1)

Two flying saucers meet in laser combat - for two players, (2) two saucers compete to see which can shoot out the most stars - for two players, and (3) one saucer shoots the stars in order to get a higher rank - for one player only. Requires Applesoft.

Golf - Whether you win or lose, you're bound to have fun on our 18 hole Apple golf course. Choose your club and your direction and hope to avoid the sandtraps. Losing too many strokes in the water hazards? You can always increase your handicap. Get off the tee and onto the green with Apple Golf. One of its nicest features is you'll never need to cancel a golf date due to rain. Requires Applesoft.

The minimum system requirement for this package is an Apple II or Apple II Plus computer with 32K of memory and one minidisk

Order No. 0163AD \$19.95



### Math Fun

Change an Apple computer into a mathematics tutor and change boredom into enthusiasm with the Math Fun package. Using the technique of immediate positive reinforcement, students can improve their math skills while playing a game with:

Hanging - A little man is walking up the steps to the hangman's noose. But YOU can save him by answering the problems posed by the computer. The program uses decimal math problems. Each correct answer will move the man down the steps and cheat the hangman. Spellbinder - You are a magician competing against a computerized wizard. In order to cast death clouds, fireballs and other magic spells on him, you must correctly answer questions about using fractions.

Whole Space - Pilot your space craft to attack the enemy planet. Each time you give a correct answer to the whole number problems posed by the computer, you move your ship. But for

every wrong answer, the enemy gets a chance to fire at you.

Car Jump-Make your stunt car jump the ramps. Each correct answer will increase the number of buses your car must jump over. These problems involve calculating the areas of different geometric figures.

Robot Duel - Fire your laser cannon at the computer's robot. If you give the correct answer to problems on calculating volumes, your robot can shoot at his opponent. If you give the wrong answer, your shield power will be depleted and the computer's robot can shoot at yours.

Sub Attack-Practice using percentages as you maneuver your sub into the harbor. A correct answer lets you move your sub and fire at the enemy fleet.

All of these programs run in Applesoft BASIC, except Whole Space, which requires Integer BASIC

Order No. 0160AD \$19.95

TO ORDER: Look for these programs at the dealer nearest you, If your store doesn't stock Instant Software send your order with payment to: Instant Software, Order Dept., Peterborough, N.H. 03458 (add \$1.00 for handling) or call toll-free 1-800-258-5473 (VISA, MC and AMEX accepted).



603-924-7296

### COMPUTER BLACKBOARD

### Dealing with Educational Realities

The person who writes a program almost certainly learns more than the person who uses that program. This is readily apparent regarding the learning of programming skills. It is also equally valid regarding the game, simulation, drill or problem that is being programmed.

Consider, for example, a program that begins by asking a student to think of any country in the world. After asking the student a few geographically-based yes/no questions, the program will correctly identify the country selected by the student. I've observed the use of this program by a third grader who used an atlas before answering many of the questions. The boy was obviously enjoying himself while learning world geography and developing mapreading skills. This was a marvelous use of a well-written program that certainly would have warmed the heart of the person who wrote the program.

Nevertheless, the program author learned a good deal more geography than the third-grade user. The author had to first identify all of the countries in the world. This is a nontrivial, real-time task on which reputable authorities appear to disagree. The author then had to write the yes/no questions that would enable the program to uniquely identify each country. This was followed by the task of creating a programmable procedure that would provide all of the desired interaction. Finally comes writing, typing and debugging the actual program code.

There's an important message in this example. Whenever possible, let the students write their own programs. The microcomputer is a magnificent "what if" machine. Students should always be encouraged to experiment with their ideas. They should never just wonder, "What if I do this or that?" They should do it and experience the consequences. The computer cannot be harmed or even in-

```
REM STUDENT NAMES - VERSION 2
20 CLS : RESTORE : M=0 : PRINT
   PRINT "PLEASE TYPE YOUR FIRST NAME"; : INPUT N$
40 READ F$, L$
50 IF F$="XXXX" THEN 90
60 IF F$<>N$ THEN 40
70 IF M=0 THEN PRINT "YOUR LAST NAME MUST BE " L$ : M=1 : GOTO 40
80 PRINT TAB(20) "OR " L$ : GOTO 40
90 IF M=0 THEN PRINT "YOU DON'T BELONG IN THIS CLASS."
100 PRINT @976, PRESS THE C-KEY TO CONTINUE";
110 X$=INKEY$ : IF X$<> "C" THEN 110
120 GOTO 20
300 DATA BARRY, WATERS, TOM, JONES, RHONDA, STEWART
310 DATA TOM, SMITH, ALICE, PETERS, CAROL, ALLEN
320 DATA CAROL, WILSON, BILL, HARRIS, TOM, MCNALLY
330 DATA DAVID, OLSON, DANIEL, SMITH
390 DATA XXXX, XXXX
                                Listing 2.
```

sulted by what is typed by a curious student. What appears to be a major disaster can be completely eliminated by turning the microcomputer off and on again.

This message—that students should be encouraged to write their own programs—is easily lost when you visit your local computer store, watch a demonstration, explore the programs in an educational resource center or even read a magazine. There are over 500 software vendors currently competing to sell you pro-

PLEASE TYPE YOUR FIRST NAME? RHONDA YOUR LAST NAME MUST BE STEWART

PLEASE TYPE YOUR FIRST NAME? TOM YOUR LAST NAME MUST BE JONES OR SMITH OR MCNALLY

PLEASE TYPE YOUR FIRST NAME?

Sample run 1.

grams. Some of these vendors have a few sound products appropriate for education. Almost none of them have products that can be used while a student is using the microcomputer to write his own program. Thus, there is a heavy commercial emphasis on already written program packages.

I encourage you to examine these packages and buy the better ones. But never lose sight of today's most significant microcomputer application—students writing their own programs.

Although you may be personally convinced of the validity of the preceding sermonette, the realities of your school situation may not permit its full implementation. After all, a student uses considerably more computer time programming and debugging than another who merely runs an educationally sound program prepared by someone else. Let's take a look at a couple of typical situations that aren't very supportive of each student writing his own program and some alternate solutions.

Consider the elementary school principal who is convinced that computer literacy must be incorporated into the curriculum for each of his 600 students. This principal is also committed to equal opportunities for all of his students. He does not want microcomputers to become the exclusive province of a small group of teachers or students. As you and I nod our heads in agreement with his goals, he throws a curve.

How can his students begin to achieve computer literacy with just one or two microcomputers? After considering several possibilities, the principal requested that a program be written to implement the following plan. He hoped to put a microcomputer in the hall outside his office with the program already loaded and running. One morning he would announce that each first grader should type his

```
10 REM STUDENT NAMES - VERSION 1
20 RESTORE : M=0 : PRINT
30 PRINT "PLEASE TYPE YOUR FIRST NAME"; : INPUT N$
40 READ F$, L$
50 IF F$="XXXX"
                 THEN 90
60 IF F$<>N$ THEN 40
70 IF M=0 THEN PRINT "YOUR LAST NAME MUST BE " L$ : M=1 : GOTO 40
80 PRINT "DR "
                L$ : GOTO 40
90 IF M=0 THEN PRINT "YOU DON'T BELONG IN THIS CLASS."
100 GOTO 20
300 DATA BARRY, WATERS, TOM, JONES, RHONDA, STEWART
310 DATA TOM, SMITH, ALICE, PETERS, CAROL, ALLEN
320 DATA CAROL, WILSON, BILL, HARRIS, TOM, MCNALLY
330 DATA DAVID, OLSON, DANIEL, SMITH 390 DATA XXXX, XXXX
                               Listing 1.
```

first name on the computer "just to see what happens." He wanted the program to respond by displaying the last name of the student. After two or three days, he would make the same announcement to the second grade, and so forth.

The initial version of a program that met these requirements was written by a fourth grader in another school. See Listing 1 and Sample run 1.

That's all there is to it. By changing the DATA statements, you can make the program apply to your class. You might also add nicknames so the computer can identify students by first name or nickname. For example, if Tom Smith's nickname is Ferd, then the DATA statements would contain both FERD, SMITH and TOM, SMITH. Alternately, the student might enter his full name and have his address displayed or enter his phone number and have his name or date of birth displayed.

Remember to use "XXXX", "XXXX" (now in line 390) as the final two items in the DATA statements, because the program uses this as an indicator that there are no more names in the list. Be careful when entering the DATA lines of this program. If you misspell a student's name, he is going to feel badly when the computer is unable to identify him.

As is the case for virtually all programs, this one can be improved. One improved version for the TRS-80 is illustrated in Listing 2. Note that the changes (lines 20, 80 and 100-120) are all user oriented. They provide a more attractive display and a reduced chance of student confusion. Should you use the program, you'll probably make additional improvements of your own.

Return for a moment to the hallway and the first graders entering their first names. Use of this program accomplished several things. Students and teachers alike learned they could touch a computer without harming themselves or the machine. Student interest was very high. They wondered, "How did it know my name? What else does it do? How does it print so

As a necessary part of his goal regarding computer literacy, the principal distributed copies of the entire program to the students during the week following their first computer experience. What did they see? They saw a few lines of BASIC that they didn't yet understand, followed by the first and last name of every student in their grade.

Then several important ideas became apparent. The computer uniquely identified Rhonda because there's only one Rhonda in first grade. Tom was given three possibilities for his last name because there are three Toms in the first grade. The students learned that the computer can process data very rapidly. But the computer does not know anything we haven't told it. That's an important idea on the road to computer literacy.

Now consider an altogether different situation. Suppose you are completely convinced that students should write their own programs whenever possible. However, educational realities require that you convince other teachers of a variety of subject areas that the computer will also be useful to them. This is a rather common political situation for teachers in many schools.

```
DRILL AND PRACTICE -- FOR ANY SUBJECT AREA
10 REM
   CLS : READ N : DIM W(N
30 C=0 : FOR I=1 TO N : W(N)=0 : NEXT I
   PRINT "HOW MANY REVIEW QUESTIONS WOULD YOU LIKE"; : INPUT R
50 FOR K=1 TO R
60 CLS : RESTORE : READ N, Q$
70 P=RND(N) : IF W(F)=1 THEN 70
80 W(F)=1 : T=0
90 FOR I=1 TO P : READ A$, B$ : NEXT I
100 PRINT : PRINT Q$; A$; : INPUT R$
110 IF R$=B$ THEN PRINT "CORRECT" : C=C+1 : GOTO 140
              THEN PRINT "NO, TRY AGAIN." : T=1 : GOTO 100
120 IF T=0
130 PRINT 'NO, THE ANSWER IS "; B$
140 PRINT @976, PRESS THE C-KEY TO CONTINUE";
150 X$=INKEY$: IF X$<>"C" THEN 150
160 NEXT K
170 CLS : PRINT "YOU ANSWERED" C "OF" R "REVIEW QUESTIONS CORRECTLY."
300 DATA 10, WHO IS THE COMPOSER OF
310 DATA YELLOW SUBMARINE, BEATLES
320 DATA SWAN LAKE, TCHAIKOVSKY
330 DATA STARS AND STRIPES FOREVER, SOUSA
340 DATA THE BRANDENBURG CONCERTOS, BACH
350 DATA THE NEW WORLD SYMPHONY, DVORAK
360 DATA 50 WAYS TO LEAVE YOUR LOVER, SIMON
370 DATA CAMELOT, LOWE
380 DATA OKLAHOMA, RODGERS
390 DATA 76 TROMBONES, WILLSON
400 DATA PETER AND THE WOLF, PROKOFIEV
```

Listing 3.

```
HOW MANY REVIEW QUESTIONS WOULD YOU LIKE? 4
WHO IS THE COMPOSER OF THE BRANDENBURG CONCERTOS? BACH
```

CORRECT

WHO IS THE COMPOSER OF YELLOW SUBMARINE? EAGLES NO, TRY AGAIN.

WHO IS THE COMPOSER OF YELLOW SUBMARINE? BEATLES CORRECT

WHO IS THE COMPOSER OF 50 WAYS TO LEAVE YOUR LOVER? SIMON CORRECT

WHO IS THE COMPOSER OF CAMELOT? SOUSA

WHO IS THE COMPOSER OF CAMELOT? RODGERS NO, THE ANSWER IS LOWE

YOU ANSWERED 3 OF 4 REVIEW QUESTIONS CORRECTLY. READY

Sample run 2.

Let's examine a single program that can be used in nearly all subject areas, although in this instance the program is adapted to music. (See Listing 3 and Sample run 2.) This program is a no-frills drill and practice exercise, but its versatility just might help convince others that microcomputers are useful. Check last month's article for one appropriate use for this type of program.

Briefly, the program selects a question at random from those in the DATA statements. If the student answers a question correctly, another question is randomly selected. If a question is answered incorrectly, the question is repeated. If the question is answered incorrectly again, the right answer is given and the next question is selected.

There are several aspects of this program worth noting. Although rather brief, it contains several features that might be included in your own drill and practice routines. Line 40 permits the student to enter the number of questions desired. This is helpful, since all students don't require the same amount of review. This feature also makes the program usable within the changing time constraints of the classroom.

Lines 70 and 80 ensure that the randomly selected questions will not be repeated during a single session. The variable T in lines 80 and 120 is used to indicate how many times a question has been incorrectly answered. This can be easily modified to allow additional tries before the correct answer is given.

Lines 130-150 allow the student to proceed at his own rate. A question and the correct answer are only cleared from the screen when the student indicates he is ready to continue.

If you don't understand lines 10 through

300 DATA 8, WHICH WORD IS THE NOUN -310 DATA BILL RAN FAST., BILL
320 DATA THE HORSE WAS TIRED., HORSE
330 DATA A SMART PERSON IS THINKING., PERSON
340 DATA THE RACE WAS CLOSE., RACE
350 DATA CANDY IS SWEET!, CANDY
360 DATA THE PROBLEM IS SOLVED., PROBLEM
370 DATA MY PENCIL IS SHARP., PENCIL
380 DATA COMPUTERS ARE FUN TO USE!, COMPUTERS

Listing 4.

170, that's OK for now, but you should try to eventually understand them. Line 300 is special since it contains the number of questions and answers (only ten in Listing 3), as well as the common portion of each question. DATA lines from line 310 to the end of the program contain each of the questions and answers that might be selected in the drill.

The most important feature of this program is that it provides you with the ability to completely change not only the questions, but also the subject area and question format by merely retyping the data lines. For example, Listing 4 illustrates data for a drill that might be appropriate for an English teacher, while Listing

5 illustrates data for an elementary school mathematics lesson.

Don't be misled by the brevity of these examples. A 16K microcomputer with just cassette storage can hold hundreds of questions and answers in a single program. A teacher who takes the time to prepare a sizable number of drill questions will provide students with an effective, comprehensive tool for review.

Remember that the student who writes a program learns more than anyone who uses the program. There are, however, many circumstances in which the programs of others can be very helpful. Hopefully the programs in this article will help you address two very common

300 DATA 11, TYPE THE MISSING NUMBER 310 DATA 2 4 - 8 , 6 320 DATA 217 - 219 220 , 218 330 DATA 27 30 33 - , 36 340 DATA 5 10 - 20 , 15 350 DATA - 7 10 13 , 4 360 DATA 4 - 12 16 , 8 370 DATA 120 130 - 150 , 140 380 DATA - 88 90 92 , 86 390 DATA 21 28 35 - , 42 400 DATA 27 36 - 54 , 45 410 DATA 15 - 31 39 , 23 Listing 5.

educational realities—serving many students with minimum microcomputer availability and demonstrating to other teachers that the microcomputer can help them in their own subject areas. The second example goes even further in that it demonstrates that teachers with no programming skills can still tailor drills for their students in precisely the fashion they choose.

Correspondence concerning this column should be addressed to Walter Koetke, Putnam/Northern Westchester BOCES, Yorktown Heights, NY 10598.

### BOOK REVIEWS

### Optimization Techniques in FOR-TRAN

Joel L. Sears Petrocelli Books, Inc. New York, 1979 90 pages, softcover, \$10

The title of this book is a misnomer.

Optimization, taken in its usual context, means to use some scarce resource of a machine less frequently. This can be done through such methods as making the program run faster or requiring less primary storage.

But in most cases, Sears does not deal with faster run times or less memory.

Programming Tricks in FORTRAN might have been a more descriptive title.

Sears shows numerous ways to get more out of your compiler than you can with most FOR-TRAN dialects. Using sample programs and clear explanations, he covers such topics as character manipulations, input/output, internal documentation facilities and subprograms.

While the material is oriented toward FOR-TRAN, many of the techniques can easily be adapted to other programming languages. To the FORTRAN programmer, this book can be an invaluable aid. To the non-FORTRAN programmer, this book can help him get a little more out of his translator.

W.A. Harrison Rolla, MO

### Digital Experiments, 2nd Edition

Richard E. Gasperini Hayden Book Co., Inc. Rochelle Park, NJ, 1978 192 pp., \$8.95

This is essentially a workbook that will guide you through 25 hands-on verification experiments. These experiments are designed to acquaint you with the operation of basic ICs and LEDs, and teach how to power them, what the pin connections look like, what kinds of outputs are obtained in response to various inputs and how to connect them.

The experiments progress not only by the sophistication of the circuit but by the amount of guidance given. The initial experiments are highly structured, with few decisions required. Later, you must look up your own pinouts. Finally, even the schematic must be worked out.

In the introduction you are told about a logic lab, which is essentially a breadboard for ICs,

power supply, switches for data input, LEDs for level indication and a slow and fast clock.

The book recommends how to buy labs or lab kits, and gives sufficient circuitry and instructions for those who care to design and build their own. It also makes recommendations regarding the acquisition of a logic probe, pulser and other equipment to carry out the experiments in this book. Seventeen different types of ICs and LEDs to be studied in these experiments are listed.

All the data sheets required for these ICs and more are furnished in an extensive appendix. Other appendices furnish data sheets on the LEDs, IC cross-references and sources of ICs.

Gasperini includes everything necessary to get the beginner started. If you choose to build your own lab, as you might after reading the recommendations, you will find not only that you have a better lab at far less cost, but also that your digital education is already well-underway.

The experiments start with the measurement of logic levels. They continue by studying the operation of the 7404 hex inverter, what happens when input leads are left open and troubleshooting. Experiments 3 to 6 cover the operation of the AND, NAND, OR and NOR gates, and 7 covers LEDs. Following this, the book discusses decoders in general, and studies a BCD to decimal decoder. Since multiplexers

are somewhat related, they are treated next. Experiment 10 covers the exclusive-OR as a comparator and as a programmable inverter.

Starting with Experiment 11, you are forced to determine your own pin connections (from the data sheets appendix). The next few experiments study the interconnection, operation and use of various kinds of latches and flip-flops. These are followed by several styles of counters, drivers and displays.

Each of these experiments is well thought out, and you are supplied with definitions, explanations and diagrams. It would be hard to

In Experiment 23 the reader is closely guided through the connection and operation of a random access memory. In Experiment 24, you are encouraged, with some guidance, to connect and operate a digital clock, using many of the ICs studied in the previous exercises. The last experiment is totally unstructured.

It is difficult to review this book without mentioning another book by the same author, on much the same subject. Digital Troubleshooting contains a great deal of very practical digital theory that would very nicely augment the theory given in Experiments. I recommend that you use the books together.

This book, along with its companion, is one of a growing number that start at a beginner's level and progress toward something more complicated. While many attempts fall short, this one does not. The book is easy to read and thoroughly enjoyable to work with, and I highly recommend it.

> Alfred Adler, Ph.D. Tucson, AZ

### **Computer Systems Organization** and Programming

Harry Katzan, Jr. Science Research Associates, Inc. Chicago, IL 1976 Hardcover, 459 pp., \$17.95

Many books cover a specific topic in great detail. But sometimes the computerist wants a more general survey of the many aspects of computer systems and programming. Computer Systems and Organization is just such a book.

It starts off with an introduction to algorithms, sequential machines and grammars, and progresses to programming languages and computer architecture. It discusses in detail the processing unit, main storage and input/output organization, and covers number systems, complement arithmetic, internal data representation, structures, lists and arrays.

The book provides a good introduction to general machine language. In addition, it covers programming techniques, including string manipulation and list processing operations.

An introduction to computer software surveys assemblers and discusses their relation to monitors and linkage editors. A section on programming techniques introduces macros, presents the relation of chaining, overlaying and common storage to the machine and structured programming and provides a thorough treatment of subprograms.

Two chapters on data management introduce external storage devices, file structures, storage device technology and data management functions, and end with a condensed treatment of data base concepts.

The author also deals with operating systems and their functions. He discusses operating system organization, scheduling, allocation, interrupt control and virtual storage methods.

Computer System Organization and Programming is a good survey of organization and programming, and does a good job of presenting the concepts that are essential for additional study. But while the book seldom gets too detailed, you should have a basic knowledge of computers. This is not for neophytes.

It is also an excellent reference book.

Warren A. Harrison Rolla, MO

### 

This month, we are pleased to introduce our readers to "Micro Quiz," a new column that will be appearing regularly in the pages of Kilobaud Microcomputing. The column appears through the efforts of Marc Brown, director of the New England Computer Science League (NECSL), which administers monthly computer contests for high-school students.

Each month, Marc will test Kilobaud Microcomputing readers with programming problems and computer questions-varying in degree of difficulty-taken from previously held NECSL contests. Answers will appear in the back pages of the same issue.

To help you better understand the source of the questions used in this column, we have included a brief profile of the history and activities of the NECSL.

Organized in 1978, the New England Computer Science League (NECSL) conducts contests for high-school students and awards prizes to outstanding students and schools on local and regional levels.

NECSL motivates students to study computer topics not covered in their school's curriculum and to pursue classroom topics in depth. It encourages students to exchange intellectual ideas and helps them to improve their computer skills. It has already provided the impetus for some high schools to expand and improve their computing facilities and course offerings.

Contests are held simultaneously at each participating school, and an unlimited number of students from all grade levels may compete at each school. A school's score for each contest is the sum of the scores of its five highest-scoring students. In each contest, students are given short theoretical and applied questions and then a practical programming problem to solve (within the following two days) using their school's computer facilities. After the contest is administered by the faculty advisor, each school's results are returned to the League for tabulation. At the completion of each year's contests, an all-star competition is held.

Short questions are designed to be both easy and difficult. This encourages students from all grade levels to participate. Much of the subject matter is new to students, but the programming problems are designed to be useful, practical real-world applications.

Providing graduated test data is another major appeal of the League. Novices can write programs on simplistic levels to handle the first few test data elements, while experienced programmers can write programs on sophisticated levels to handle the more difficult test data elements.

High schools have chosen to implement NECSL in many different ways. Some schools that do not offer any computer courses have used NECSL as the focal point for their computer club. Some have used the contest materials to supplement existing courses, and some schools have even used NECSL as the outline for an entire course in computer science.

The NECSL idea blossomed under the direction of Marc Brown, currently a graduate student in Computer Science at Brown University in Providence, Rhode Island. In its first year, NECSL operated in an experimental mode only in Rhode Island. It soon became apparent that there was a tremendous need for a computer science league, and the League then expanded into the remaining New England states the next year. Today, participation is open to all schools throughout the entire country.

Currently, a handful of annual programming contests exists throughout the United States. NECSL is unique because its contests cover many aspects of the science, not merely programming, and contests are regularly held each month, not yearly.

Queries regarding column questions or solutions or the NECSL should be addressed to: Marc Brown

NECSL Box 1910 Brown University Providence, RI 02912

> Upon completion of the following program, how many different elements of array X will have been accessed?

DIM X(10)**FOR** J=1 TO 6READ A X(A-J)=JNEXT DATA 8, 3, 10, 6, 7, 7

answer on page 214

### NEW PRODUCTS

### Panasonic's Handheld Computer

The RL-H1000 is a modular handheld computer (HHC) that features a full complement of separate peripheral devices including an input/ output interface to attach up to six additional peripherals, an acoustic coupler/telephone modem, cassette interface, video RAM interface for hook-up to a home TV set, a mini printer and RAM and ROM memory expanders. The RL-H1000 accommodates four 16K, 32K, 64K or 128K ROM capsules. Four additional capsules can be added with a ROM expander module. It has 65 re-assignable keys and a keyboard overlay system. A complete ASCII character set, in addition to the "help" key, makes traditional command programming easy. Three user-definable function keys accommodate specific capsule programs, multiple key sequences and specialized terminal functions. A memory key allows entrance into RAM from within any program and automatically selects the proper RAM mode for each program. With the four-direction window control, you can drive anywhere within any program or memory

A full matrix liquid crystal display graphics panel is incorporated on the RL-H1000. It displays graphics, foreign alphabet characters and proportional spacing, as well as full upper and lowercase ASCII. A ten-speed display control key gives information at varying rates of speed.

The RL-H1000 has a built-in RAM, so you can store up to 500 characters for use as a por-

table, electronic memo pad. A self-contained world time clock displays month, date, hour and minute. The HHC has a programmable timer with alarm and message function to work as an electronic secretary. It is also compatible with virtually every computer data bank via the telephone modem/acoustic coupler.

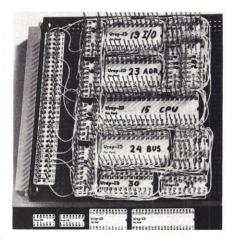
Panasonic Company, One Panasonic Way, Secaucus, NJ 07094. Reader Service number 483.

### Socket-Wrap ID

Now you can easily identify pin numbers on wire-wrapping sockets with the Socket-Wrap ID from OK Machine and Tool Corporation, 3455 Conner St., Bronx, NY 10475. These socket-sized plastic panels with numbered holes in the pin locations can be simply slipped onto the socket before wrapping. You can also write on them for easy identification of location, IC part number or function to simplify both initial wire-wrapping and subsequent troubleshooting or repair. Reader Service number 498.

### **Direct-Connect TRS-80 Modem**

Lynx is a new direct-connect telephone modem for the TRS-80 that eliminates the need for a separate expansion interface, interface board, telephone coupler and communications



OK Machine and Tool's pin number identifier.

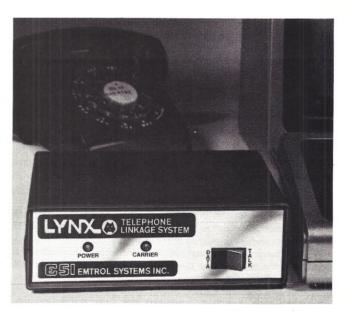
software. It connects directly with the keyboard and the telephone line; no acoustic coupler is used. It includes originate and answer capability and is programmable for word length, parity, number of stop bits and full or half duplex. During data exchange, it automatically disconnects the local telephone handset, thus eliminating room noise pickup typical of acoustic couplers.

Minimum hardware requirements are a Level I or II with 4K RAM. Including a terminal cassette program, instruction manual and power pack, the Lynx costs \$239.95.

Emtrol Systems, Inc., 1262 Loop Road,



Panasonic's HCC with peripherals.



The Lynx modem.

### Instant Software New Releases

### LIFE

Would you like to play god?

Even if you've only been involved with computers for a short while, you're certain to have heard of Life. The game was originally created by British mathematician John Conway and popularized in Martin Gardner's Mathematical Games column in Scientific American magazine. Life, a computerized simulation of the life cycle of a colony of bacteria, allows you to manipulate both the bacteria and their environment.

Over the years the game has lost none of its fascination for computerists. It is based on a few simple concepts but it results in captivating, animated graphics displays.

There are two versions of Life included in

this package. The first is written in machinelanguage and is the most versatile, flexible and the swiftest version of Life we've ever seen. The second is in BASIC with machine-language subroutines. This allows both the machine-language devotee and the BASIC aficionado to experiment with the program.

Patterns can be created and edited easily. You can create your own "creatures" or use the library of preprogrammed creatures. You can run at full speed (100 to 200 generations per minute), enter a pause factor, or single step through the life cycle.

No matter how you approach Life, whether artisitically, mathematically, intuitively, or just for fun, this is THE classic program.

Order No. 0078R \$9.95



### **Investor's Paradise**

Stock Trek—This is a stock market simulation in which you and up to five other investors buy and sell stocks. See if you can transform \$5000 into a fortune in twelve short months. The program has an automatic ticker tape that announces market conditions plus a stock price display board. You can ask for a prospectus that will describe each stock and its dividend potential. Finally, you can see the performance of each stock displayed on a graph. At the end of one (simulated) year, the computer will display the net worth of all investors. The player with the greatest net worth is advised to

Speculation—This program goes a step beyond

The Investor's Paradise package lets you exmarket without risking a dime.

Order No. 0125R \$9.95

the dealer nearest you (see list of dealers on page 205). If your store doesn't stock Instant Software send your order with payment to: Instant Software, Order Dept., Peterborough, N.H. 03458 (Add \$1.00 for handling) or call tollfree 1-800-258-5473 (VISA, MC and AE ac-

can make a killing in the market..

start looking at the financial pages. being a mere simulation. You enter the financial data on up to 25 real companies and start playing the market. You can buy and sell shares based on net cost, including sales commissions. You'll be able to compare how you did in the

TO ORDER: Look for these programs at

perience all the thrills and triumphs of the stock

cepted).

Imagine that you've been given a large sum of money and have the opportunity to see if you

market, based on the value of your portfolio and accumulated dividends, versus investing your money at a fixed rate of interest. This program can simulate up to five years of playing the market in computer time and all your data can be stored on tape for future reference. Although this program isn't intended to simulate actual market conditions, it comes darned close.

\*A trademark of Tandy Corporation

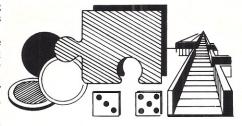
### Winner's Delight

Are you a winner? Do you enjoy challenging yourself with thorny tasks? Then try Winner's Delight. This quartet includes:

Amazing-You must escape from a maze, one that you view from the inside. You must work against the clock-and you may meet a nasty dwarf who can block your passage to freedom. Junior Checkers-Not your usual game of checkers... The challenge is to beat the computer in the fewest number of moves.

Jumbo Jigsaw-Fit the pieces of the jigsaw together in the fewest number of tries. The program offers three levels of expertise for you to choose from.

Thirteen Ways-Try to fill up your columns with the numbers you roll on dice. Lady Luck may be with you or against you. But you may



be certain that the computer will be plotting how to fill its columns first!

You too can be a winner, with Instant Software!

Order No. 0124R \$9.95



### **Body Buddy**

Get to know the Inner You. Use this package to learn your caloric needs and to set up a weight-loss diet. It will also introduce you to human anatomy and physiology.

The Adult Caloric Requirements program can determine your Basal Metabolic Rate, after you respond to a computerized "questionnaire". Then the program makes recommendations on how you can reach an ideal weight, through dietary planning.

Our Flexi-Diet program will create a practical diet for you. Choose your caloric intake, from 600 to 2400 calories per day. The program will make up sample menus for any meal you desire. If you don't care for its choices, it will make as many alternative menus as you like!

In the Anatomy Quiz program, a human torso is drawn on your video monitor and you must locate various organs within the body. After you've made your choice, the program gives a mini-lesson, which includes the organ's size, exact location and major bodily functions.

Body Buddy: Let it change you for the bet-

Order No. 0109R \$9.95



Prices subject to change without notice.

Peterborough, N.H. 03458



The TRS-80's Color Computer, Model III and Pocket Computer.

Lancaster, PA 17604. Reader Service number

### **Three New Computers** From Radio Shack

Radio Shack, 1800 One Tandy Center, Fort Worth, TX 76102, recently unveiled three new TRS-80 computers: Model III, Pocket Computer and Color Computer.

The TRS-80 Model III desktop computer is designed for more data storage, greater versatility and higher computing speed. It is housed in a single cabinet that includes a 65-key keyboard, 12-inch high-resolution video monitor, power supply and space for up to two built-in double-density disk drives. Available in several configurations, it is priced from \$699 for the 4K version and is expandable to 32K with 313K of disk storage for \$2495. Model III BASIC is compatible with most Model I programs.

The TRS-80 Pocket Computer features a large 24-character LCD display with English language prompting and BASIC programming. It includes 1.9K RAM that retains information for the 300-hour life of its internal batteries. The six-ounce, seven-inch-long pocket computer can be used as a calculator to edit, store, review and place numbers in mathematical equations with up to 15 levels of parentheses. Tapes can be loaded with an optional cassette interface and may also be used to store programs and data. Price is \$249.95.

The Color Computer features high-resolution color graphics using any home color TV as a video monitor and instant-load Program Paks. It has a 53-key typewriter-type keyboard, a screen format of 16 lines, 32 characters per line, graphics array from  $32 \times 64$  to  $196 \times 256$ , 1500 baud cassette interface and RS-232-type serial interface. In addition to using the plug-in Program Paks, you can program the computer in BASIC and control the color graphics, sound, data manipulation and storage. User programs and data may be stored on an optional cassette recorder. Utilizing its built-in RS-

232C serial interface, it can serve as a TRS-80 Videotex terminal with optional software and modem. The 4K RAM, 8K ROM version sells for under \$400. Reader Service number 482.

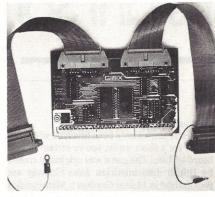
### **TRS-80** Lowercase Modification

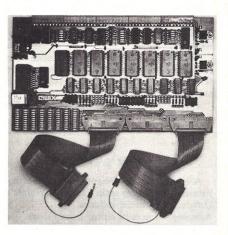
The TRS-80 lowercase hardware modification from Integrated Service Systems, Inc., 1011 West Broadway, Minneapolis, MN 55411, includes a printed circuit board that connects to the CPU board through a ribbon cable and several wires. You have to remove a 2102 video RAM and install a socket in its place for the ribbon cable. This is not for the novice in soldering iron techniques. It is very easy to lift an etch by applying too much heat. I suggest having a professional do the installation, unless you are experienced with the tools of the trade. The instructions for installation come in a step-bystep format and are easy to follow.

The modification allows 32 additional graphics characters and an indicator in the lowercase mode. Lowercase characters feature pseudo descenders. The modification comes with software drivers on cassette in 4K, 16K. 32K and 48K format. The cassette I received had a bad 16K dump, so I had to use the 4K to look at the operation of the mod. The drivers were single dumped on only one side of the tape. I would like to see at least one set of drivers dumped on each side of the tape to give you a second chance if one of the dumps is bad.

The driver to activate the mod is unique. I tried the mod with several other drivers (one was called a universal driver) without finding any compatibility. You have to use the supplied driver, which will have to be incorporated into any word-processing software you buy for your system. The professionally constructed hardware modification is one of the cleanest I have seen. However, I wish the mod worked with a more universal type of driver. Price is \$41.95. Reader Service number 475.

**Edward Umlor** Fitzwilliam, NH





The Gimix two-port and eight-port serial I/O boards.

### 6800/6809 I/O Boards

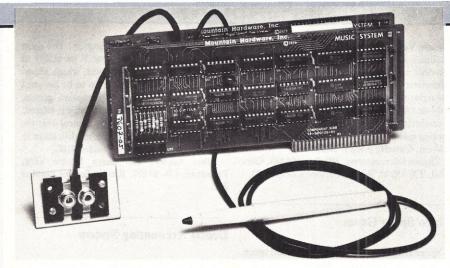
The Gimix 2 Port Serial I/O board has two independent RS-232-compatible I/O ports, with handshaking, on a single 30-pin board. It features jumper-programmable connector pinouts for easy cabling, independent baud rate and interrupt jumpers for each port and the 6850 ACIA. The board is compatible with both the SS-50 (four addresses per I/O slot) and SS-50C (16 addresses per slot) bus configurations. Price is \$128.43.

The Gimix 8 Port board features eight independent RS-232-compatible I/O ports on a single 50-pin board. It includes DIP-switch selectable baud rates for each port, extended address decoding for the SS-50C bus, selectable interrupts and the 6850 ACIA. The board is available with an onboard baud rate generator for baud rates up to 38.4K baud. Price is about

Gimix, Inc., 1337 West 37th Place, Chicago, IL 60609. Reader Service number 481.

### Digital Music Synthesizer

MusicSystem is a 16-voice digital synthesizer that permits the creation of the sounds of real musical instruments for the Apple II. The generation of sounds is accomplished through fully programmable waveforms, envelopes and am-



Mountain Computer's MusicSystem.

plitudes for each musical "voice."

Provided with the hardware system is software for editing and playing musical compositions. The Editor program permits graphical input of sheet music utilizing standard music notation. The player program permits polyphonic performance of musical compositions. Stereo output is possible through the stereo amplifier and speakers or directly off the card with stereo headphones. Price is \$545.

Mountain Computer, Inc. (formerly Mountain Hardware), 300 Harvey West Blvd., Santa Cruz, CA 95060. Reader Service number 477.

### 132/80 Column Printer

The MS-204 is a bidirectional, 9×7 dot matrix printer that accommodates 40, 66, 80 or 132 characters per line. It features a print head life of 100 million characters, a 125 cps print speed and a throughput print speed of 63 lpm. The adjustable sprocket feed mechanism allows use of forms from 2.5 to 9.5 inches wide, with loading from either the bottom or rear. A full 96 ASCII set permits printing upper and lowercase characters that can be expanded for double width fonts in boldface. The VFU (vertical format unit) provides pre-programmed/ programmable tab positions, top of form and bottom of form.

The MS-204 is compatible with TRS-80, Apple, PET, Sorcerer or any other Centronicstype system. Price is \$795.

Matchless Systems, Dept. 7, 18444 South Broadway, Gardena, CA 90248. Reader Service number 479.



Matchless Systems' 132/80 column printer.

### **Anadex Line Printer**

The DP-9500 is a dot-matrix line printer with one of the nicest executed designs I have seen. The unit is light and easy to carry from one setup to another. It features built-in parallel, serial and current loop interfaces, as well as two type fonts  $(9 \times 9 \text{ and } 7 \times 9)$  for 10, 12 or 13.3 characters per inch and six or eight lines per inch. Double width format is also available in both fonts. Speed ranges from 150 cps to 200 cps, depending on the type selected. Graphics are individual dot addressable in a 7 × 1 format. All parameters (except I/O format) are software selectable, as well as switch selectable. The printer will handle edge-punched paper from 1.75 to 16.875 inches.

It takes only a few minutes to unpack and set up this printer. Since it was already selected for parallel (Centronics-format) operation, the



The DP-9500 Line Printer from Anadex.

printer was hooked up to a TRS-80 word-processing system. The printer performed correctly the first time out. The ready line holds data from going to the printer prematurely, so that all characters were present.

The print quality in both fonts is crisp and clear. A lever, with detent stops, at the left side of the carriage controls the distance of the print head from the platen. Just set the lever for maximum separation to load the paper more easily, and then set it back for the correct impact pressure. This is a much better arrangement than the fixed gap method used by most printers.

The operation was flawless, except for incorrect perforation skip on each new page. This might have been caused by paper drag as the paper came out of its box. When I adjusted the skip setting from one inch to half an inch, there wasn't any paging problem.

I recommend this printer as an excellent addition to any system. It is fast, clean and compatible with any system currently on the mar-

Anadex, Inc., 9825 De Soto Ave., Chatsworth, CA 91311. Reader Service number 476.

> **Edward Umlor** Fitzwilliam, NH

### (/ S( )FT

### **Braille Translator**

The DS Micro Translator is a microcomputer-based, word-processing and braille-translating system designed for use by schools, universities, agencies and businesses that serve and/or employ blind persons. The system provides for both automatic translation of text to braille and conventional, general office word-processing tasks. The system permits a sighted person with no knowledge of Standard English Braille, which is a complex, semiphonetic code, to enter and edit material from newsletters, memos and class notes to full-length books. Entered text is automatically translated and either formatted by the computer to produce high-quality braille copies of the material or formatted without translation for equivalent print copies. The micro translator renders text into braille at the rate of more than 300 characters per second.

For further information, contact Duxbury Systems, 56 Main St., Maynard, MA, 01754. Reader Service number 489.

### **Z-80 Data Base Management System**

Target/80 is a data base management system for Z-80 microcomputers from Condor Com-



APF's Space Destroyer for the Imagination Machine.

puter Corporation, 3989 Research Park Drive, Ann Arbor, MI 48104. It contains many of the features of Condor's DBM-I and is designed for transaction processing applications. Applications, developed using a nontechnical command language, can be created for personnel, accounting, inventory or other business reporting requirements. The new version uses 19 commands, including relational operations for selecting, sorting, appending or posting data. Target/80 is compatible with most Z-80 microcomputers with at least 48K RAM running under CP/M operating systems. Price is under \$700. Reader Service number 494.

### General Ledger System

GL, a general ledger program for the TRSDOS 1.2 on the TRS-80 Model-II, provides immediate financial information for your company by keeping a record of all financial transactions. Features include double entry accounting, ISAM and a full 80-column screen display. It is flexible, interactive, menu-driven and provides automatic integration with A/P, A/R and payroll programs. It requires a 132-column printer, a dual disk system and 64K memory. The \$129 price includes a reference manual, an installation guide, 15 programs and sample data files on an eight-inch diskette.

Micro Architect, Inc., 96 Dothan St., Arlington, MA 02174. Reader Service number 488.

### Loan Analysis Software

Personal Loan Analysis is a new software package for the Atari 400 and 800 systems that consists of five menu-selected programs:

Loan Repay-allows the comparison of different interest rates, payment periods and present values.

Number of Time Periods-computes the time required to pay back a loan given a set monthly payment amount and a fixed interest rate.

Fresent Value—computes the amount of a loan available if the consumer knows his maximum monthly payment.

Amortization-computes all pertinent data for the repayment of a loan.

Add-on/Annual Percentage Rate Conversions -converts the add-on rate to the annual percentage rate or the annual percentage rate to the add-on. Cassette price is under \$15.

Zapata Microsystems, PO Box 401483, Garland, TX 75040. Reader Service number 493.

### Video Space Game

Space Destroyer is a new cassette video space game for the Imagination Machine from APF Electronics, Inc., 444 Madison Ave., New York, NY 10022. It tests your commandeering skills to maneuver a squadron of three space destroyers against a continuous wall of phasorfiring aliens. One or two players may enter the battlefield. Points are awarded and displayed on the screen. Sound effects heighten the action of the contest. Price is \$19.95. Reader Service number 495.

### CP/M Software Guide

The CP/M Software Summary Guide, a list of major software used on most CP/M systems, includes summaries of the CP/M operating system, Microsoft BASIC, CBASIC and the CP/M utilities DESPOOL, MAC and TEX. Commands and utilities are explained briefly with examples. This 60-page booklet organizes features alphabetically, so you can find an explanation quickly rather than page through various function sections. Price is \$3.75.

Rainbow Associates, PO Box 35, Glastonbury, CT 06025. Reader Service number 491.

### Basic-Aid for CP/M

Basic-Aid, for programmers who work with Microsoft BASIC, allows one or two key entries of over 40 BASIC statements and commands. It also has nine user-definable buffers for frequently used code (two with 64 characters and seven with 16 characters). It includes a configuration program that allows it to be placed anywhere in memory. The program will run on any 8080 or Z-80 CP/M system and is available on Micropolis five-inch and standard eight-inch disks.

Mendocino Software, PO Box 1564, Willits, CA 95490. Reader Service number 492.

### **Star Trac BASIC Monitor**

The Star Trac extension to North Star BASIC 5.1 offers the first fully interactive debug monitor for any microcomputer BASIC. It allows you to insert a breakpoint in the BASIC program and assume full keyboard control over subsequent execution. The most powerful feature of Star Trac is its ability to assert a conditional breakpoint, which allows control over a BASIC program to be assumed when a specified program symptom occurs, such as when the value of a variable is altered. This monitor allows complete control over the BASIC program without any modification to the program itself. Price is under \$100.

Allen Ashley, 395 Sierra Madre Villa, Pasadena, CA 91107. Reader Service number

### **Dental Accounting System**

Now your office computer can handle complete dental billing with MicroDent, a dental billing system that will automate your billing procedure, improve turnaround of insurance form processing and provide mail-list and information processing for your patient records. This program keeps track of services rendered, bills patients and/or insurance organizations, handles insurance pre-authorization and prepares statements. It handles insurance form types, or you can easily modify the formats that are used in the system if new forms are added or existing forms are altered.

You can sort through patient information and prepare a mailing list using 15 sort criteria keys. With a form letter merge utility, you can send personalized form letters, dunning messages or notices to selected patients. MicroDent (under \$1000) is available in most popular disk formats for CP/M-based systems.

MicroDaSys, PO Box 36275, Los Angeles, CA 90036. Reader Service number 487.

### Apple II File Management System

Filemaster II is a file management system for storing, classifying, manipulating and retrieving data in the Apple II microcomputer. The system includes four Applesoft programs-File Designer, Search and Retrieval, Sort Information and File Converter. Program features include computed numeric fields from userentered formulas, provisions for creating a sub-



MicroDaSys' dental billing system.

### "Hellfire Warrior".

"Hellfire Warrior." Really not for everybody: newcomers to Announcing Dunjonquest should begin with something easier. Here the monsters are deadlier, the labyrinths more difficult, the levels far more challenging...

> But for the experienced Dunjonquest game player there are more command options, more potions (13I), more magical items (including at last - magical armor), more special effects, more surprises. And an innkeeper, an armorer, apothecary and magic shops.

In part a sequel to The Temple of Apshai, up until now the greatest of all the Dunjonquest games, Hellfire Warrior can also be played

a fantastic completely on its own. new Dunjonquest™ computer game

Now the character you've created, representing the highest level of roleplaying to date, can explore the four new lower levels:

that's really

Level 5- "The Lower Reaches of Apshai." With the giant in-

not for within the Labyrinth. And man-eating monsters can thwart Level 7-"The Vault of the Dead."... And of the

sects and other nasties that swarmed through the upper levels of Apshai. With rooms your hero can get into, but not out of.

Level 6- "The Labyrinth." The only exit is hidden

everybody: undead-skeletons, ghouls, mummies, specters... **Beginners** 

invisible ghosts-lurking in the rooms, doors, secret passages, ready to reduce your hero to a pale shadow of himself. Permanently. Level 8- "The plains of Hell." In an Underworld of lost souls and shades of dead, of dragons and fiery

are likely to be gobbled up

hounds, of bottomless pits and blasts of hellfire, our hero must rescue the beautiful warrior maiden lying in enchanted sleep within a wall of fire. And bring her past unbelievable dangers and monsters...

even Death itself...to sun and air and life

in the first room...and

Hellfire Warrior. The most exciting game yet from Automated Simulations, the leading producer of computer fantasy games.

there are over 200 rooms on

Guaranteed: If it's not the most exciting computer game you've played, return it within ten days for a complete refund.

four levels

Available on disk for the Apple II and Radio Shack's TRS80, or on cassette for the TRS80 and for the Commodore PET. The cassette: \$24.95; the disk: \$29.95. Complete with a magnificent instruction manual. Some of the drawings in the manual are reproduced here (in greatly reduced scale).





Use the handy coupon or, if you wish to order by MasterCard or VISA, use our toll-free phones: In the United States: operator 861 (800) 824-7888; In California: operator 861 (800) 852-7777; In Hawaii and Alaska: operator 861 (800) 824-7919.

Sub Total \$  Plus shipping & handling \$1.00 each  *Plus sales tax for California residents  TOTAL \$
☐ I enclose my check in the amount of \$
☐ Please charge to my ☐ VISA or ☐ MasterCard account  My card no Expires
Signature
Name
City/State/Zip*California residents: please add 6% or 6½% sales tax as required.

file onto a second disk and retrieval of both active and nonactive records, as well as special input routines and error trapping. It requires 48K, Applesoft ROM and a disk drive. Price is under \$100.

Rainbow Computing, Inc., Garden Plaza Shopping Center, 9719 Reseda Blvd., Northridge, CA 91324. Reader Service number 496.

### TRS-80 Assembly-Language **Development Package**

Racet Computes, 702 Palmdale, Orange, CA 92665, has recently released an extended development package for Model II assemblylanguage programmers. The package includes the following programs:

Macasm-an editor/assembler that includes macro conditional assembly capabilities, inmemory compiles and debug facilities. Source programs can be saved on disk and subsequently reloaded into memory. A range of lines can also be loaded or saved.

Szap-provides the capability to read and modify any sector on a diskette and provides a generalized facility for copying any number of sectors from one area (or disk) to another.

Dis2-a system for the disassembly of Z-80 machine-language code, which can be from memory or from a standard DOS load module from disk. Price is \$125. Reader Service number 485

### **ESP Lab**

Reviewed by Eric Maloney, Microcomputing staff

It was only a matter of time before someone came out with a computer program to test extrasensory perception. But while Manhattan Software, Inc. (PO Box 5200, Grand Central Station, New York, NY 10017), claims that ESP Lab is designed for "serious research," the program will have to undergo some careful scrutiny before it can be accepted as a legitimate tool for scientific study.

ESP researchers have spent years trying to establish the credibility of their work. While they have an endless supply of anecdotal evidence that we humans have extrasensory powers, proving it in the lab has been another story. Trying to isolate and identify ESP to the satisfaction of the scientific community is like trying to catch smoke rings with a butterfly net. A computer only adds another variable to be accounted for.

ESP Lab (\$9.95; for the 16K TRS-80, Level II) tests for three types of ESP-telepathy, clairvoyance and precognition-and for telekinesis. Except for the telepathy test, the program can be used by two people-a tester and a respondent—or alone.

The ESP tests are based on the experiments of Dr. J. B. Rhine, whose work at Duke University was instrumental in making ESP the popular subject it is today. Rhine's experiments were done largely with a deck of 25 cards, each marked with a symbol. The deck included five each of squares, circles, triangles, ovals and double-wavy lines.

ESP Lab simply substitutes the computer for the cards. In the telepathy test, the computer randomly selects a symbol, and the keyboard operator tries to mentally project an image of the symbol to another person. In the clairvoyance experiment, the computer selects a symbol and presents a question mark; the tester or respondent enters the guess. In the precognition test, the respondent tries to guess what symbol the computer is going to select. In all three cases, after 25 symbols, the computer displays the guesses and correct answers.

Several problems become immediately evident. To begin with, while the program is based on the Rhine cards, the symbols are actually abstractions generated inside the computer. The respondent thus has no physical object to focus on. This may or may not be important to someone with extrasensory abilities, but has to be a consideration for the serious experimenter.

Also, if the experimenter is self-testing, the tendency is to guess the keys that represent the symbols, rather than the symbols themselves. Again, this may not be critical, but researchers

CLAIRVOYANCE TRIALS

SUBJECT: ERIC MALONEY DATE: 7/14/80

TRIAL # 1

SYMBOL RESPONSE CROSS TRIANG LINES SQUARE 3 SOHARE LINES 4 OVAL LINES 5 CROSS OVAL 6 CROSS LINES 7 SQUARE TRIANG 8 TRIANG CROSS 9 CROSS CROSS 10 CROSS CROSS 11 CROSS OVAL 12 TRIANG LINES 13 SQUARE SOUARE 14 SQUARE SQUARE 15 LINES TRIANG 16 TRIANG LINES 17 LINES SQUARE 18 OVAL TRIANG 19 SQUARE TRIANG 20 SQUARE LINES 21 CROSS OVAL 22 SQUARE SQUARE 23 TRIANG SOUARE 24 CROSS LINES 25 CROSS SOUARE CORRECT RESPONSES: PRECOGNITION SCORE: POSTCOGNITION SCORE:

Sample run 1. The program lists the symbols selected by the computer, and the subject's responses. The precognition and postcognition scores indicate the number of times the receiver correctly guesses the previous or next symbol.

can't dismiss the possibility that it may influence test results.

The telekinesis test is better suited to computer use. A box with a dot in the middle appears on the screen. The user indicates whether he will try to mentally influence the dot to go left or right. Eventually, the dot moves to one side or the other. If the dot moves to the indicated side more than half of the time, this is possible evidence of telekinesis

No matter what the test, the serious student is faced with major questions concerning the influence the computer has on the results. It is impossible to say whether electrical energy has an effect on telepathic abilities. Some scientists have hypothesized that telepathy might actually be carried on electromagnetic waves. And anyone living near high-tension lines can testify to the deadly impact electricity can have on plant and animal life.

From here, we get into even more esoteric questions. Might some people be more compatible with computers than others, and thus be better receivers? Could some computers be better transmitters than others? Can a computer have ESP?

Most of these questions will concern the serious experimenter only. For others, ESP Lab has a variety of useful applications. For example, it is ideal for the psychology or math student studying probability and statistics, and makes a perfect demonstrator for a class investigating ESP and the mind. In both cases, students can run through the tests quickly and easily, and can get printouts for permanent records or future analysis.

This program is also good for the curious individual who simply wants to make an informal study of the subject. A casual investigation can often be more productive than one conducted in a more formal setting.

Finally, ESP Lab is an excellent party game. It has the appeal of keno or roulette—no matter whether you believe in ESP or chance, there is always the urge to try beating the odds.

By the way, you can test yourself for telekinesis without this program. Using your mental powers, try turning your computer off.

Reader service number 499.

ш	CORR	PPPGGG	DOGMO	100
#	CORR.	PRECOG	POSTC	JUG
1	5	7	6	
2	2	5	3	
2 3	2 2 9	6	3	
4		6	4	
5	4	4	8	
6	7	4	4	
7	3	3	3	
8	4	8	6	
9	3	4	4	
10	6	5	6	
AV.	CORR.	RESPON	SES:	4.50
777	PRECO	G SCORE	· and facilities to	5.20

score of 5 is considered average.

### LETTERS TO THE EDITOR

### **Teachers and Computers**

As noted in your June issue of Kilobaud Microcomputing, the area of investigating the possibilities and potentials of microcomputers in the classroom is still "virgin," in that the industry hasn't sincerely begun to address the aspect of microcomputers as instructional tools. Granted, there is an abundant source of software for drills and practice. For public school systems, this may be sufficient in itself, if only to relieve the strains of a high student-to-teacher ratio. In our school, with a low (15:1) ratio, such drills are considered superficial to the learning process. A nucleus of parents and faculty has just formed to investigate the possibilities and potentials of microcomputers in the classroom.

While a handful of parents recognize the importance of introducing human-to-processor communication to our children at as early an age as possible, we're constantly confronted with the question of how we should implement the processor into the curriculum as an instructional tool. Specifically, we envision utilizing the computer(s) for an introductory course in programming (primary unit). An area of application, sidestepped too long, is simulation. We would like to see the computer used to reinforce the learning process through automated problem analysis or trend analysis based on variables that are input.

We are now at the point where we (faculty and parents) would like to touch bases with individuals who have successfully gone this route. If those in the field of education or the microcomputer industry can supply us with concrete, logical steps toward implementation of such a program, it would be sincerely appreciated.

> Art Lane 78 Whitney Dr. Meriden, CT 06450

William Murdoch 60 Schooner Lane Meriden, CT 06450

### **Counting 0,1,2...**

In "Questions and Answers on Memory Devices" (July 1980, p. 164), the author has done a disservice to novice computerists with his answer, "... just because," referring to a ques-

As a legitimate question, it deserves a similar answer. Zero is the track's identifying number, not a track count. Computerists, like everyone, count the first item as one; however, that item's "name" is often zero for a good reason. In any

number system, using 0 to identify an item allows you to distinguish, with a single digit, a number of items equal to the base (ten items for decimal, 16 for hexadecimal, eight for octal). Ignoring 0 requires the use of a second digit, hence, more memory, to identify the same number of items.

Granted, with 77 tracks, this point is obscure; however, the consistent application of this convention leads to some degree of memory conservation.

> P. V. Piescik Wethersfield, CT

Mr. Piescik's point is well taken. Nonetheless, I don't think many people use the zero numbering convention for the sake of conserving memory. In most cases, either approach will work equally well. (Referencing 77 tracks on a floppy disk, for instance, will require seven bits, regardless of whether the first track

Although my original answer may have seemed flippant, it is essentially correct. The zero numbering convention is simply an established design practice that novices might as well go along with.

> **David Price** Midlothian, VA

### A Better Terminal

Frank Derfler's OSI C1P terminal program ("Dial-up Directory," July 1980, p. 68) is most interesting and useful. Regarding the RS-232C information, the signal voltages are allowed to be between  $\pm 5$  and  $\pm 25$  V dc. Positive voltage is a logic 0 on the data lines and a logic 1 on the control lines. The need for an external TTL-to-RS-232C interface circuit between the OSI output and the modem input is made unnecessary by cutting the trace identified as W10 on the foil side of the board. A negative 5 volts is then connected to J3, pin 7 (and not to the modem). This will allow positive and negative voltage swings as required by the RS-232C definition.

> John G. Ruff Minnetonka, MN

### **SWTP Is No Fun**

Why doesn't anyone make any "fun" software for the SWTP 6800? Business programs, operating systems, file sorting and management and letter addressing are available for us home types with small systems, but we're not all serious, you know.

Those TRS-80, Apple and PET guys have all

the fun with Chess, Adventures, Flight Simulation and Interlude. There is nothing available for the SWTP in this vein, except some old TSC programs that are quite simplistic by today's standards. In any event, a very finite number of these are extant, with nothing new in sight. Now that our beloved SWTP has all but abandoned us to their fancy 6809 system, we are adrift in space.

Not that I would trade my 6800 for anything on the market. I like to be able to open the cage to view boards that even an idiot would understand. I like the 6800's easy-to-use instruction set. My primary interest is hardware, and the SWTP is great for those of us who want to build special boards and otherwise tinker.

More of us SWTP types should write to thank Kilobaud Microcomputing for their support. Listen, SWTPers, if Microcomputing stops supporting us because they think we don't care, all we'll have is either a specialty newsletter that thinks that everyone has a disk system with gigabytes of memory and otherwise publishes gossip or all those pretty, colorful, commercial magazines like you-know-who. And what about the Gimix and Smoke Signal types? Are they only interested in file sorting and management? Wouldn't they also like to play games, even just a little?

Lest all the other types smirk, the handwriting is on the wall. TRS-80 Level I is soon going to be in the same boat. Let them try a turn at the bailing bucket.

> John Tavares San Jose, CA

### Pay Now or Pay Later

John A. Bryant's article and program are well-written ("Calculating Interest Rates," July 1980, p. 134). However, I believe there is a flaw in the program, because it doesn't output the correct interest rates.

If I borrow \$1000 from the bank at six percent for one year, the interest is \$60. My monthly payment is \$1060/12, or \$88.33. If I enter this data in the program (principal, \$1000; monthly payment, \$88.33; and term of one year), the computer says the interest rate is 10.89 percent.

> Ken Walters Red Ash, VA

It does look like six percent, Ken, and, in fact, when I was a young fellow it was called a six percent loan. The Truth in Lending Act changed that and requires that the annual percentage rate (APR) be given on a loan. In your example, the APR is 10.89 percent, just as the computer said. The loan would have been a six

percent loan if there were no monthly payments and you simply paid back a lump sum of \$1060 a year after borrowing \$1000. But when you pay it back in monthly installments, you don't have the use of the entire sum for the full year, so the effective interest rate is higher. Thanks for your compliments on the program and article; I probably should have explained APR.

John A. Bryant Holcomb, NY

### **Shopping Around**

I am a professional writer who is keenly and sincerely interested in buying a word-processing system. After reading many books and magazines on the subject to attain a smattering of understanding of the possibilities of what's out there in the market, I stuffed my checkbook into my pocket and eagerly set out to buy. Two months later, after visiting a dozen or so computer stores in Toronto and Buffalo, I still haven't bought a system, simply because no-body will take the trouble to sell me one.

It is my finding that the staff and owners of computer stores come in two types. Type one sneeringly bedazzles the tyro shopper with an incomprehensible jargon of "forty-eight-kay-bus-byte-zed-eighty-menu-interface-vabnagraph!" Type two asks "Whadaya mean, word processing? Wanna see the video games? And it'll do your income tax really neat!"

I respectively ask owners of computer stores to look a little more closely at the way in which their sales staff responds to customers to ensure that their staffs acknowledge that a good deal of would-be buyers drift out the door from lack of adequate service. Finally, ask your sales staff to try a little harder than a perfunctory "You'll need that blue box over there and that black dingus there, and the rest's in this manual." Anybody want to sell me a word-processing computer? Please?

Sidney Allinson 24 Ravencliff Crescent Scarborough, Ontario Canada

It's little wonder that some computer stores are having difficulty. How many potential users have been turned off to micros because of treatment like you received? How many sales have been lost?—Editors.

### Computers on the Air

Aficionados of 6502 microprocessor personal computers have new ways to exchange comments and information. Three new radio nets on amateur radio frequencies have been announced.

An East Coast Apple Net now operates on Saturday mornings at 1300 GMT (9 AM, Eastern Daylight Savings Time) on or near 7260 kHz. Transmission mode for this 40 meter net is lower sideband, with W1UKZ in Scituate, MA, as net control.

In the greater Boston area, there is a new 2

meter net, on the Norwell repeater (144.65/145.25 MHz) for those interested in Apple computers. W1UKZ, WA1ZKB and others act as net control. This net is called to order at 8 PM local time, Wednesday evenings.

A new Atari International Computer Net now meets at 0100 GMT, Tuesdays (9 PM EDST, Monday evenings) on 20 meters. Look for this net on upper sideband around 14.329 kHz. W1UKZ in Scituate, MA, acts as net control.

Aside from conversation about computers in general and the subject computers in particular, these nets will act as funnels for as much official information about computer developments as can be gleaned from the manufacturers. Program swapping via the mails is undertaken, with projected exchange via radio anticipated as more and more computer owners interface with their radio equipment.

David Allen Scituate, MA

### **Designing Alphabets**

Your design for a computer-readable handwritten alphabet ("Publisher's Remarks," August 1980, p. 6) is similar to a project that I have been working on for several years. We spent considerable time and effort developing a new method of handwriting at an early childhood Montessori school (Ashdon Hall in Atlanta, GA). As a side project, using the same pedological techniques, I developed an alphabet design that required a 12-segment LED for electronic display, but readability is easy for the average, untrained person. Readers who are interested in this project can contact me. This method of handwriting for computer recognition could be taught in all elementary schools as part of teaching handwriting.

> Hugh S. Hunt 12219 River Road Potomac, MD 20854

### **Identifying PET ROMs**

I enjoyed "A 'Personable' Calendar" by G. R. Boynton (August 1980, p. 168). As he said, it is a program just waiting for you to personalize. While some might criticize its lack of some of the programming niceties, I very much enjoyed the program, which did exactly what he set out to do.

My comment does not apply specifically to his program, but to PET programs in general. Since CBM has chosen to have a few different ROM sets, we have to look out for the differences, since not all PET programs will run on all PETs. It would help us true novices (not programmers or electronics types) if the programs were identified for their ROM sets, so we would know whether to convert all POKE/PEEK statements.

Gerald Key Gahanna, OH

Good idea, Gerald. Future PET authors, take note.—Editors.

### Industrial quality components for S-100 system builders, from California Computer Systems.

2422 Disk Controller. Single and double density controller for up to four 5½" or 8" single-sided drives, or two double-sided drives. Shipped with CP/M 2.0, the controller reads and writes IBM-standard single density. Automatically determines disk density—single or double. Supports PerSci auto eject, plus fast-seek for voice coil systems.

2810 Z80 CPU Board. Capable CPU for S-100 Systems operates at 2 or 4MHz, is fully Altair/Imsai compatible. Z-80 monitor is available separately. Includes auto addressing to 4K boundaries, plus a serial port for serial devices, including terminals and printers. Supports both front-panel operation and power-on memory jump, plus wait-state generation for slower memories. Compatible with proposed IEEE S-100 standards.

2032A 32K Static RAM. Fast static memory operates without wait states at a full 4MHz. Supports full and partial bank select, for expansion beyond 64K. Addressable in 8K blocks at 8K boundaries. Address and data lines are fully buffered, and there are no DMA restrictions.

2016 16K Static RAM. Fully buffered board features 2114 static RAMs for +5v operation. Bank select available by bank port or bank byte, for system expansion beyond 64K. Addressable in 4K blocks at 4K boundaries. LED indicators for board selection and bank selection. Available in 200, 300, or 450 nsec versions. All versions support 4MHz operation with no wait states.

**2200A Mainframe.** Rock solid, heavy gauge cabinet includes 12-slot, actively terminated S-100 motherboard, fan, and power supply. Power supply features 105, 115, or 125 volt AC input power; provides +8vDC at 20 amps, ±16v DC at 4 amps. Available in five colors. Includes convenient, front mounted, lighted reset switch.

**2501A Mother Board.** 12 slots, actively terminated, with all S-100 connectors included. Distributed power line bypass, low inductance interconnect—extremely low bus noise.

**Prototype Boards.** Four high quality prototype boards: Solder Tail, Extender/Terminator, Wire Wrap, and Etch.

**P2802AA 6502 CPU.** Stand-alone CPU generates fully S-100 compatible I/O signals; executes 6502 machine language. Operates at 2MHz; capable of DMA operation.

### Available nationally.

California Computer Systems industrial quality S-100 products are available at over 250 computer retailers. Volume customers should contact the marketing department at CCS

### **CCS.** Industrial standards.

# see the S-10 ttle different Industrial quality means top grade materials, com-

We mass-produce S-100 products to deliver industrial quality, at industrial prices.

You systems builders who need top quality, full featured, *workhorse* S-100 building blocks at the most competitive prices now have a source. California Computer Systems.

Industrial quality means top grade materials, components, and assembly, plus complete testing for absolute reliability.

Industrial quality means solid designs, a full complement of the important features you require, and a product line that delivers performance.

Industrial pricing comes from mass production. We buy at the right prices, and build *in quantity*, using state-of-the-art facilities and techniques. Including complete burn-in, for full performance right off the shelf.

Our industrial point of view means you get higher performance, greater reliability, and lower prices. If these are features you would like to see in your S-100 system, see things our way.

Because for serious users with serious uses for the S-100, these are the industrial standards.



California Computer Systems

250 Caribbean Sunnyvale, CA 94086 (408) 734-5811

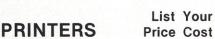


### **WE HAVE** A FULL HOUSE





### **Buy Only From** a "Factory Authorized Source"



Okidata Microline 80 . . . . . . \$ 945.

Anadex Model DP-8000 SASK for or DP-8000AP . . . . \$1095. Our Price

Anadex Model DP-9500 Ask for or DP-9501.....\$1650. Our Price

Epson Model TX-80B Ask for Friction Feed ....\$ 710. Our Price

Epson Model TX-80B

Tractor Feed & Ask for Graftrax . . . . . . . \$ 799. Our Price

Epson Model Ask for MX-80 .....\$ 699. Our Price

### INTERFACES

Okidata Microline 80 Tractor Feed. . \$100. Okidata Microline 80 RS-232 Interface with 256 Character Buffer . . . . . . . \$200. All above Printers -Cable from Printer to TRS-80 ....\$ 35. Epson-Serial Interface & Cable . . . . . \$ 90. Epson-IEEE 488 Interface & Cable \$ 80. Epson-Apple Plug-in Interface & Cable .....\$110.



### PRINTER STANDS



Systems Furniture Universal Printer Stand without top, but with paper basket . . . . . \$120.

### TRANSIENT CLIPPERS



The ideal Line Voltage Transient Clipper from PDF protects against • High Energy Voltage Transients On-Off Switching • Lightning Induced Transients. Model C-120Q (Other Models Stocked) . . . . . . . \$57.50

ASK FOR **OUR INSTANT DISCOUNT!** 

CALL TOLL FREE U.S.A. 1-800-521-2764 MICHIGAN 1-800-482-8393



WRITE TO: "The Stocking Source" 23995 Freeway Park Dr. Farmington Hills, MI

James Owens Professor of Management American University School of Business Washington, D.C.

# Computerized Estate Planning

This OSI program takes the tedium out of calculating and sorting the various options for the final settlement of your wealth.

any people spend a lifetime building an estate (often worth hundreds of thousands of dollars) only to let it go to waste at their death. They plan their lives successfully, but do little or no planning for the disposition of their tangible worth. Much of the estate is thus diverted into estate taxes, probate costs, administrative expenses and a legion of other costs, instead of being channeled efficiently—and mainly intact—to surviving loved ones.

To avoid such problems, the responsible person plans for the inevitable event. He examines his family's future rationally, coolly and in ways that maximize the net estate actually received by intended beneficiaries. The financial community calls this estate planning, and anybody can handle its legion of complexities and mathematical computations with a small computer (and, of course, a lawyer).

Estate planning is a must for all working-

age people, not just senior citizens. A 50-year-old man might suffer a sudden heart attack anytime, or a 30-year-old divorced mother might die in an automobile accident. In either case, an unplanned estate usually means hardship for survivors, for whom they worked so hard during life. Given the obvious necessity for priority attention to a personal last will and estate planning, why do so many neglect such a vital matter? Three reasons, mainly: they're



Enter in line	Variable and sample entry	Description of Variable
810	Y = 1979	Base year for all data entries and calculations
820	B = 50	Wife's age in base year
830	J = 51	Husband's age in base year
840	TI = 20000	"Death benefit" from husband's retirement program
850	PL = 2000	Annual increase in the value of TI (above)
860	YD = 1999	Estimated or assumed year of wife's death
870	A = 150000	Life insurance (except amount in line 840 above)
880	SA = 5000	Total cash, checking accounts and savings in base year
890	S1 = 1000	Estimated or assumed future annual savings
900	HV = 50000	Value of home in base year
910	P=.06	General inflation (cost of living) rate for prices
920	K = .10	Average rate of earnings (income) on invested funds
930	S4 = 500	Widow's Social Security monthly income in base year (if she were age 60 in base year and awarded maximum)
940	ET,E = 650,322	Wife's monthly expenses (if husband dies in base year) in two parts: those subject to inflation; home payment that is not
950	PR = 40000	Mortgage (principal) on home in base year

too busy with the demands of a busy life to think about death; it is most unpleasant, if not traumatic, to confront the issue of one's death and make cool, rational plans for it; and the arithmetic involved in estate planning (calculating the projected income for survivors, varying incomes for varying insurance amounts, effect of estate taxes, etc.) is too time-consuming and complicated. And yet, for many, the most critical act they will perform—or not perform—in life will involve estate planning.

If you have, or have access to, a computer (even a small one limited to just 4K of RAM memory), the program described here can easily remove the major obstacles to your estate planning. It does all the necessary calculations, evaluation of alternative plans and financial projections, quickly enough for the busiest executive or careerist.

### **Program Objectives**

The program is designed to project anyone's net estate after taxes (as actually inherited by survivors), as well as survivors' monthly income, including Social Security benefits, for any assumed year of death of that person and for any number of years following death. Yearly calculations include changing home value, equity in home, savings and net worth.

The program can also quickly reveal the minimum life insurance required for a particular person and situation and the ultimate effect of inadequate or no life insurance.

Finally, the program might prompt some readers to search out and organize vital statistics about their finances and the data necessary if they are to be in control of their lives.

### **Data Required**

I have kept data requirements to run the

program at a minimum, and they should be easily available to the user. (I permitted the program itself considerable complexity to keep data entry easy and convenient.) Sixteen data are all that need be entered into the data lines (Table 1), and most of these will be immediately accessible. You might have to examine your retirement program to determine its "death benefit" and annual increase in value (for lines 840 and 850); contact the Social Security Administration for the current (base year) amount for line 930 and determine current monthly expenses to realistically project expenses for line 940.

All other data are obvious (such as your age) or assumed (such as projected inflation rate in line 910). Enter these 16 data to run the program. (Table 1 includes sample data for a hypothetical, but realistic, case; program output for this case is displayed in Table 2.) Some of your data might be zero, as in lines 900 and 950, if you are renting rather than buying a residence; in many cases, line 840 and 850 will also be zero.

The sample data used here assume the following: a husband (age 51) and wife (age 50), with no dependent children, owning a \$50,000 home with a \$40,000 mortgage at nine percent for 30 years and a \$322 monthly payment (excluding taxes and insurance), husband's death benefit value and life insurance total of \$20,000 plus \$150,000, savings of \$5000 and an estimate of six percent for inflation in future years.

### **Program Output**

Program output (Table 2) generates two loops: the first (or outer) loop, always starting with the expression "if husband dies in," displays wife's net cash received (after taxes) and her monthly income including any Social Security benefits for that particular year of his death from 1980 to 1999. The second (or inner) loop, always starting with the expression "at wife's age," displays the

wife's monthly income, expenses, monthly surplus (positive or negative), home value, equity in home and cumulative surplus for each year of her life after his death in the year stipulated in the particular outer loop year. (1999 above can easily be changed in line 860 for more or fewer years' projections.)

If this looks complicated, the potential reality it represents is just that—complicated. The wife's income and, other variables change depending upon two factors: the year of the husband's death and (for each year of his death) the number of years (her age) following his death.

For example, if he dies in 1985, the base amount of insurance, savings and so on determining the next ten or 20 years of her life's monthly income is far different than the base amount if he died in 1980. In the sample data and output, the program generates 361 inner loop displays (19 inner loop financial situations times 19 outer loop possibilities of death), and all are different depending on the two factors. Fortunately, the program incorporates and handles these complexities, and the program user need only enter base year data (as above) and read the output information for each year.

To illustrate several immediate uses of the program output (still using Table 1 sample data), suppose that the husband dies in 1980. In that year, when the wife is 51, her monthly surplus or margin is a comfortable \$431. But by the time she is 59, just before Social Security benefits are activated at 60, her monthly surplus has declined to zero. The reason is that her income is frozen at the level of the year of the husband's death while inflation drives up monthly expenses each year.

Fortunately, in this case, her cumulative surplus from prior years is sufficient to absorb the erosion of the monthly surplus. By contrast, if life insurance had been \$100,000 instead of \$150,000, the wife's monthly surplus at 59 would be -\$419 and cumulative surplus -\$20,000 (obviously, the economic system would not extend her such borrowed funds, and the only option would be a drastic collapse in her standard of living).

For anyone using this program, many assumptions can quickly be entered into data lines and run to test their long-term consequences, especially assumptions about minimum life insurance needed at any given time.

### **Program Mechanics and Documentation**

The program has two loops—an outer GOTO loop and an inner FOR-NEXT loop. The inner loop also incorporates a number of subroutine loops. Many secondary variables (such as BB) and temporary variables (such as V1) are used to isolate the intended effect on one loop from the unintended ef-

fect upon the other as numerical values need programmed changes in both—but at different program points. Using the basic variables in the Table 1 data list as a starting point, it will be easy to trace the logic and movement of the program.

Program documentation (REM lines) has been eliminated and placed instead in the text here to minimize memory required to run the program. As listed, the program can output 20 or more outer loops, each with 20 or more inner loops, and do it within the limits of a 4K RAM memory system. Thus, anyone, even with his first personal computer, can use the program immediately.

Only a few other program lines need special comment:

- Social Security benefits are initiated and "indexed" in lines 116, 131 and 930.
- Estate taxes are calculated in line 126.
- Death benefit (line 840) is frozen at husband's retirement age in line 121.
- Monthly expenses subject to inflation are increased by P factor in lines 133 and 177.
- Calculations for home value, amortization of mortgage and home equity are in lines 310 through 315.

Note that, in line with past years' patterns, the annual increases in home value are set two percentage points above the rate of general inflation (P), and that home value and equity rates of increase decline slightly in the later years of a run to reflect some real depreciation with age. For brevity, I used different formulas to calculate home value and equity in the outer as contrasted with the inner loops; this results in slight, but insignificant, absolute value variations in the later years for each loop during a run.

### **Program Modifications**

My primary criteria in the program design were convenience and ease of use. At times, however, you will want to modify the program itself. Mainly, there are three such occasions.

The first concerns the estate tax formula built into the program. Current law allows a \$250,000 marital deduction when a husband passes his estate, at death, to his wife (provided he explicitly declares in his will his intent to do so—neglect in making a will with such an explicit statement in it disallows the deduction and deprives the wife of about \$80,000 to taxes!).

Current law has also set the unified credit against the actual net estate tax at \$47,000, deductible from the tax itself. Thus, if you plan your estate properly, you can take advantage of the deduction and credit and pass on an estate of up to \$400,000 with no estate taxes at all. But the law changes often—usually every two years with congressional elections. When it does, make the change in the program in line 126 by substi-

```
*********************
10 REM
               ** ESTATE PLANNING
20 REM
30 REM
               **
                       PROGRAM BY J. OWENS, PH. D., 1979 **
46 REM
               **
50 REM
               *************
60 DEF FNT(X) = INT(X * 1 + 5)/1
70 DEF FNH(X) = INT(X * 100 + 5)/100
100 READ Y, B, J, TI, PL, YD, R, SR, S1, HV, P, K, S4, ET, E, PR
110 YY=Y : B8=B : T=TI : HW=HY : RP=PR : AR=A
115 IF B>59 THEN GOTO 120
116 S4=FNT(S4+(S4 * P * (60-B)))
120 PRINT"IF HUSBAND DIES IN"; Y+1; "WIFE WILL INHERIT CASH:"
121 Y=Y+1 : B=B+1 : J=J+1 : IF J<66 THEN TI=TI+PL
123 SR=SR+S1 : TT=TI+R+SR : T9=TT+EH : X=X+1
125 PRINT"INSURANCE"; A; "+ DEATH BENEFIT"; TI; "+ SAVINGS"; SA; "="; TT
126 IF T9>426000 THEN TX=FNT((T9-426000)*.33) : IFT9<426000THENTX=0
128 V=TT-TX
129 IF B < 60 THEN SS=0
130 IF B>59 THEN SS=FNT(S4)
131 IF B)59 THEN S4=S4+(S4*P)
132 VV=FNT((V*K)/12)
133 ET=ET+(ET*P) : EX=FNT(E+ET)
135 PRINT"NET CASH INHERITED LESS TAXES("; TX; ") ="; V
136 PRINTTAB(15); "MONTHLY INCOME="; VV; "+SOC. SEC. "; SS; "="; VV+SS
140 FOR R= 1 TO (YD-(Y+1))
145 PRINT
150 PRINT"AT WIFE'S AGE"; BB+1; "(IN"; YY+1; ")"
160 BB=BB+1 : YY=YY+1 : IF BB>60 THEN GOTO 170
165 IF BB>59 THEN SS=54
170 IN=VV+SS:SS=FNT(SS+(SS*P)):EE=E7+E8:IF EE>EX THEN GOTO 177
175 E7=E : E8=ET
177 EE=FNT(E7+E8) : E8=E8+(E8*P)
200 EE=FNT(E7+E8) : SU=FNT(IN-EE)
300 PRINT"HER MONTHLY INCOME="; IN; "AND EXPENSE="; EE; "(SURPLUS="; SU
305 IF R=1 THEN HE=HV-PR
310 HV=HV+(HV*(P+. 02)) : V1=PR*. 09 : V2=E*12 : PR=PR-(V2-V1)
315 HE=HV-PR: REM AMORTIZING AT 9% AND BY YEAR, NOT MONTH
325 PRINTTAB(8); "HOME VALUE="; FNT(HY), "HOME EQUITY="; FNT(HE)
330 CS=CS+(SU*12)
350 PRINTTAB(8); "WIFE'S CUMULATIVE (MONTH-BY-MONTH)SURPLUS="; CS
500 NEXT R
510 EE=EX : E7=E : E8=ET
520 BB=B : YY=Y : T=TI : CS=0
522 HV=HW+(HW * ((P+, 02)* X))
530 PR=RP-(((E*12)*X)-((RP*, 09)*X))
540 PRINT"*********************************
600 IF Y=YD THEN END
650 PRINT
700 GOTO 120
810 DATA 1979
820 DATA 50
830 DATA 51
840 DATA 20000
850 DATA 2000
860 DATA 1999
870 DATA 150000
880 DATA 5000
890 DATA 1000
900 DATA 50000
910 DATA . 06
920 DATA . 10
930 DATA 500
940 DATA 650, 322
950 DATA 40000
```

Program listing. Estate Planning program in OSI BASIC.

tuting new numbers for the present line's .33 and 426000.

The second possible modification involves life insurance provisions throughout the program that cannot be handled in the data lines. The program assumes a set amount of life insurance (as entered in line 870) until the husband's death. If a portion is term or group insurance, ending at the husband's retirement age of 65, that amount must be deducted by adding a new program line. If, for example, the term amount ending at 65 were \$20,000, then

Line 122 IF J = 65 THEN LET A = A - 20000

If the amount affected here were \$30,000 terminating at age 62, line 122 would be-

IF HUSBAND DIES IN 1980 WIFE WILL INHERIT CASH INSURANCE 150000 + DEATH BENEFIT 22000 + SRVINGS 6000 = 178000 NET CASH INHERITED LESS TAXES( 0 ) = 178000 MONTHLY INCOME= 1483 +50C. SEC. 0 = 1483

AT WIFE'S AGE 51 (IN 1980 ) HER MONTHLY INCOME= 1483 AND EXPENSE= 1852 (SURPLUS= 431 HOME VALUE = 54000 HOME EQUITY = 14264 WIFE'S CUMULATIVE (MONTH-BY-MONTH)SURPLUS= 5172

AT WIFE'S AGE 52 (IN 1981 ) HER MONTHLY INCOME= 1483 AND EXPENSE= 1096 (SURPLUS= 387 HOME VALUE = 58729 HOME EQUITY = 18872 WIFE'S CUMULATIVE (MONTH-BY-MONTH)SURPLUS= 9816

RT WIFE'S AGE 53 (IN 1982 ) HER MONTHLY INCOME= 1483 AND EXPENSE= 1143 (SURPLUS= 340) HOME VALUE = 62986 HOME EQUITY = 23851 WIFE'S CUMULATIVE (MONTH-BY-MONTH)SURPLUS= 13896

AT WIFE'S AGE 54 (IN 1983 ) HER MONTHLY INCOME= 1483 AND EXPENSE= 1192 (SURPLUS= 291 HOME VALUE = 68824 HOME EQUITY = 29232 WIFE'S CUMULATIVE (MONTH-BY-MONTH)SURPLUS= 17388

RT WIFE'S RGE 55 (IN 1984 ) HER MONTHLY INCOME= 1483 AND EXPENSE= 1244 (SURPLUS= 239 HOME VALUE = 73466 HOME EQUITY = 35046 WIFE'S CUMULATIVE (MONTH-BY-MONTH)SURPLUS= 20256

AT WIFE'S AGE 56 (IN 1985 ) HER MONTHLY INCOME= 1483 AND EXPENSE= 1299 (SURPLUS= 184 HOME VALUE = 79344 HOME EQUITY = 41330 WIFE'S CUMULATIVE (MONTH-BY-MONTH)SURPLUS= 22464

AT WIFE'S AGE 57 (IN 1986 ) HER MONTHLY INCOME= 1483 AND EXPENSE= 1358 (SURPLUS= 125 HOME VALUE = 85691 HOME EQUITY = 48120 WIFE'S CUMULATIVE (MONTH-BY-MONTH)SURPLUS= 23964

AT WIFE'S AGE 58 (IN 1987 ) HER MONTHLY INCOME= 1483 AND EXPENSE= 1420 (SURPLUS= 63 HOME VALUE = 92547 HOME EQUITY = 55458 WIFE'S CUMULATIVE (MONTH-BY-MONTH)SURPLUS= 24720

RT WIFE'S AGE 59 (IN 1988 ) HER MONTHLY INCOME= 1483 AND EXPENSE= 1486 (SURPLUS=-3 HOME VALUE = 99950 HOME EQUITY = 63388 WIFE'S CUMULATIVE (MONTH-BY-MONTH)SURPLUS= 24684

RT WIFE'S AGE 60 (IN 1989 ) HER MONTHLY INCOME= 2283 AND EXPENSE= 1556 (SURPLUS= 727 HOME VALUE= 107946 HOME EQUITY= 71957
WIFE'S CUMULATIVE (MONTH-BY-MONTH)SURPLUS= 33408

AT WIFE'S AGE 61 (IN 1990 ) HER MONTHLY INCOME= 2331 AND EXPENSE= 1638 (SURPLUS= 781 HOME VALUE= 116582 HOME EQUITY= 81218 WIFE'S CUMULATIVE (MONTH-BY-MONTH)SURPLUS= 41820

RT WIFE'S AGE 62 (IN 1991 ) HER MONTHLY INCOME= 2382 AND EXPENSE= 1708 (SURPLUS= 674 HOME VALUE = 125909 HOME EQUITY = 91226 WIFE'S CUMULATIVE (MONTH-BY-MONTH)SURPLUS= 49908

AT WIFE'S AGE 63 (IN 1992 ) HER MONTHLY INCOME= 2436 AND EXPENSE= 1792 (SURPLUS= 644 HOME VALUE= 135981 HOME EQUITY= 102041 WIFE'S CUMULATIVE (MONTH-BY-MONTH)SURPLUS= 57636

AT WIFE'S AGE 64 (IN 1993 ) HER MONTHLY INCOME= 2493 AND EXPENSE= 1880 (SURPLUS= 613 HOME VALUE = 146860 HOME EQUITY = 113729 WIFE'S CUMULATIVE (MONTH-BY-MONTH)SURPLUS= 64992

AT WIFE'S AGE 65 (IN 1994 ) HER MONTHLY INCOME= 2554 AND EXPENSE= 1973 (SURPLUS= 581 HOME VALUE= 158608 HOME EQUITY= 126360 WIFE'S CUMULATIVE (MONTH-BY-MONTH)SURPLUS= 71964

AT WIFE'S AGE 66 (IN 1995 ) HER MONTHLY INCOME= 2618 AND EXPENSE= 2072 (SURPLUS= 546 HOME VALUE: 171297 HOME EQUITY: 140010 WIFE'S CUMULATIVE (MONTH-BY-MONTH)SURPLUS= 78516

RT WIFE'S RGE 67 (IN 1996 ) HER MONTHLY INCOME= 2686 AND EXPENSE= 2177 (SURPLUS= 589 HOME VALUE: 185001 HOME EQUITY: 154762 WIFE'S CUMULATIVE (MONTH-BY-MONTH)SURPLUS= 84624

RT WIFE'S RGE 68 (IN 1997 ) HER MONTHLY INCOME= 2758 AND EXPENSE= 2289 (SURPLUS= 469 HOME VALUE= 199801 HOME EQUITY= 170705 WIFE'S CUMULATIVE (MONTH-BY-MONTH)SURPLUS= 98252

.

IF HUSBAND DIES IN 1995 WIFE WILL INHERIT CRSH INSURANCE 150000 + DEATH BENEFIT 48000 + SAVINGS 21000 = 219000 NET CASH INHERITED LESS TAXES( 0 ) = 219000 MONTHLY INCOME= 1825 +50C. SEC. 1135 = 2960

AT WIFE'S AGE 66 (IN 1995 ) HER MONTHLY INCOME= 2968 AND EXPENSE= 2072 (SURPLUS= 888 HOME VALUE= 118800 HOME EQUITY= 83380 WIFE'S CUMULATIVE (MONTH-BY-MONTH)SURPLUS= 10656

RT WIFE'S RGE 67 (IN 1996 ) HER MONTHLY INCOME= 3828 AND EXPENSE= 2177 (SURPLUS= 851 HOME VALUE: 128384 HOME EQUITY: 93561 HIFE'S CUMULATIVE (MONTH-BY-MONTH)SURPLUS= 20868

RT WIFE'S RGE 68 (IN 1997 ) HER MONTHLY INCOME= 3100 AND EXPENSE= 2289 (SURPLUS= 811 HOME VALUE = 138568 HOME EQUITY = 184562 WIFE'S CUMULATIVE (MONTH-BY-MONTH)SURPLUS= 38688

IF HUSBAND DIES IN 1996 WIFE WILL INHERIT CASH: INSURANCE 150000 + DERTH BENEFIT 48000 + SAVINGS 22000 = 2200000 NET CASH INHERITED LESS TAXES( 0 ) = 220000 MONTHLY INCOME= 1833 +SOC. SEC. 1203 = 3036

AT WIFE'S AGE 67 (IN 1996 ) HER MONTHLY INCOME= 3836 AND EXPENSE= 2177 (SURPLUS= 859 HOME VALUE= 123128 HOME EQUITY= 87988 WIFE'S CUMULATIVE (MONTH-BY-MONTH)SURPLUS= 10388

AT WIFE'S AGE 68 (IN 1997 ) HER MONTHLY INCOME= 3108 AND EXPENSE= 2289 (SURPLUS= 819 HOME VALUE = 132970 HOME EQUITY = 98548 WIFE'S CUMULATIVE (MONTH-BY-MONTH) SURPLUS= 20136

IF HUSBAND DIES IN 1997 WIFE WILL INHERIT CASH: INSURANCE 150000 + DEATH BENEFIT 48000 + SAYINGS 23000 = 221000 NET CRSH INHERITED LESS TRXES( 0 ) = 221000 MONTHLY INCOME= 1842 +SOC. SEC. 1275 = 3117

RT WIFE'S RGE 68 (IN 1997 ) HER MONTHLY INCOME= 3117 AND EXPENSE= 2289 (SURPLUS= 828 HOME VALUE = 127440 HOME EQUITY = 92596 WIFE'S CUMULATIVE (MONTH-BY-MONTH) SURPLUS= 9936 \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

IF HUSBAND DIES IN 1998 WIFE WILL INHERIT CASH: INSURANCE 150000 + DEATH BENEFIT 48000 + SAYINGS 24000 = 222000 NET CASH INHERITED LESS TAXES( 0 ) = 222000 MONTHLY INCOME= 1850 +50C. SEC. 1352 = 3202

AT WIFE'S AGE 69 (IN 1998 ) HER MONTHLY INCOME= 3202 AND EXPENSE= 2407 (SURPLUS= 795 HOME VALUE= 131760 HOME EQUITY= 97204 WIFE'S CUMULATIVE (MONTH-BY-MONTH)SURPLUS= 9540 \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

The third possible modification makes the program more convenient to use. As programmed, any output will display in sequence many inner loop years for each outer loop year of the husband's death. For a quicker summary, outputting outer year results only, change line 140 to: FOR R = 1

If you want only, say, three inner loop years for each outer loop year, then use line 140 in the form:

FOR R = 1 TO 3

### Conclusion

This program is no substitute for your lawyer's and banker's professional advice about your will and strategies available in estate planning. But it makes the calculations you need to see future objective results of current decisions or options, and helps evaluate those decisions and options.

Dr. James Owens is the director of the Department of Management Sciences and a professor of management and organizational behavior at the American University School of Business Administration in Washington, D.C.

### 051

Video Games I \$15 Head - On, Tank Battle, Trap!

Video Games 2 15 Gremlin Hunt, Indy 5000, Gunfight

Board Games I 15 Cubic, Mini-Gomoku

10 **Dungeon Chase** A D&D video game

12 CI Shorthand (C2/4/8 ready soon)

For BASIC-in-ROM systems

SEND FOR FREE CATALOG

**Orion Software** Associates -329 147 Main Street Ossining, NY 10562

### SPECIAL 10% DISCOUNT ON SOFTWARE FOR SORCERER®

APPLE ®

TRS-80

ADVENTURELAND You wander through an enchanted world trying to recover 13 lost treasures counter WILD ANIMALS, MAGIC BEINGS, and many other perils and puzzles.

PIRATE ADVENTURE by Scott Adams 'Yo Ho Ho and a bottle of rum...' You'll meet up with the pirate and his daffy parrot along with many strange sights as you attempt to go from your London flat to Treasure Island, Can you recover LONG JOHN SILVER'S lost trea-

MISSION IMPOSSIBLE ADVENTURE

by Scott Adams Plenty of adventure as you try to complete your mission in time to save the world's first automated nuclear reactor

\$14.95

VOODOO CASTLE Beware of the Voodoo man as you try to save Count Cristo from the fiendish curse. You are his only hope!

\$14.95

MAGIC ISLE by Tim Quinlan This is a fantasy simulation where you are the the ruler of the Magic Isle, where sorcery and mythological creatures are the order The Magic Isle is beset with evil curses, plaques, monsters, devastating storms and

DEMO PROGRAM This is a great program for showing off your computer. It emulates museum computer exhibits. Chatty and personal, it plays several games and gives a math test in addition, subtraction, multiplication and division, with a score when finished. The games it plays are Guess My Number, Craps and Tic-Tac-Toe

by Tim Quinlan OTHELLO III A strategy game played on eight by eight Trie object of the game is to capture as many of the squares as possible. You can play against the computer, a friend or have the comput-

PERSONAL FINANCE PACKAGE by T. Quinlan

This package contains three programs to aid you in handling your personal finances. The first is a Checking Account Program; the second program helps you keep track of your budget and the final program computes interest on loans, mortgages and charge a counts.

What are you doing in a big brass bed in Transylvania and why did the postman deliver a bottle of blood to you?

STRANGE ODYSSEY by Scott Adams Marooned at the edge of the galaxy, you've stumbled on the ruins of an ancient alien civilization complete with fabulous treasures and unearthly technologies. \$14.95

MYSTERY FUN HOUSE by Scott Adams Can you find your way thru the strangest Fun House in existence, or will you be kicked out when the park closes?

\$14-95 \$13.45

HOUSE OF SEVEN GABLES by G. Hassett Explore the House of the Seven Gables and find treasures, they're all yours if you can find them . However, there's a catch, you have to destroy the witch to leave.

JOURNEY TO THE CENTER OF THE EARTH

by Greg Hassett Beware of the earth's hazards as you attempt to gather materials to fix your broken earthdigger.

\$12,95

KING TUT'S TOMB Beware the evil that lurks within the tomb as you search for Tut's sarcophagus and escape with the treasures and your life...if you're \$12.95

SORCERER'S CASTLE by Greg Hassett Find and enter the Sorcerer's castle. gather the treasure, kill the Sorcerer and try to

\$12,95

ENCHANTED ISLAND by Greg Hassett Explore the enchanted island for fame and riches. Danger and adventure await you a

every turn in this magic place. \$12.95 \$11.65 ATLANTIS by Grea Hassett

Search for treasure in the ancient sunk en city of Atlantis, but beware of its dangerous inhabitants and the giant whirlpool.

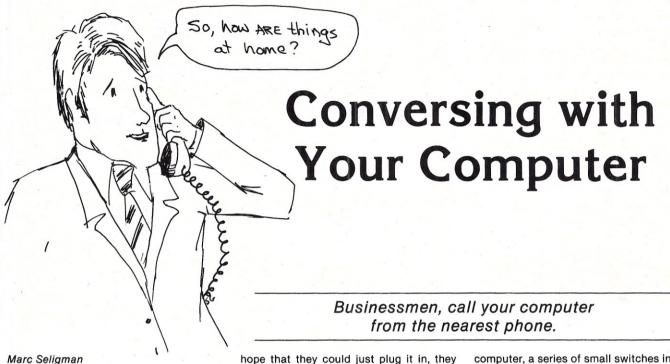
GALACTIC BLOCKADE RUNNER by T Quinlan

You are the captain of a federation starship battle cruiser. Your mission is to run an enemy blockade and to deliver vital supplies to federation forces under seige on Planet M/5

WE PAY SHIPPING AND HANDLING ON ALL ORDERS OVER \$10.00 WITHIN THE U.S. ORDERS UNDER \$10.00 PLEASE ADD \$1.00.

### CONNECTICUT RESIDENTS PLEASE ADD 7 1/2% SALES TAX. MICRO DISCOUNT SERVICE

Eastford, Conn. 06242 243 Old Colony Road (203) 974-1214



Remote use of your computer is neither as expensive nor as complicated as you might believe. Follow these instructions and you will be able to tie into your computer from a friend's house, a business meeting or your favorite watering hole.

320 Bryn Mawr Ave.

Bala Cynwyd, PA 19004

This article is most useful to owners of the Vector MZ system with the Mindless Terminal. It can also be adapted for other MZ systems and for computers from other manufacturers. You must, however, design your own conversions.

The Vector MZ has enjoyed remarkable success throughout the country, but especially on the West Coast. Due to its popularity as a small-business system, major modifications are often needed. The trouble is, most purchasers have no knowledge of machine coding or assembly language, and don't wish to learn. They want a fast, reliable system. They are not hobbyists, but dedicated users who need their computers for serious business applications. When they have a problem, they want it solved now, without a lot of footshuffling and programs-take-time-to-write excuses.

Were these users to ask about telephone interfacing at their computer store, they would most likely be steered to an expensive and complicated internal auto-answer modem. It they were foolish enough to buy an auto-answer external modem with the

hope that they could just plug it in, they would be in for a rude awakening.

### **Telephone Connections**

This method is inexpensive and amazingly effective. The necessary parts include a Vector MZ with Mindless Terminal, a Texas Instruments Model 745 portable data terminal set to mark parity (\$1595), a Data Access Systems Model DASI 68-01 modem (\$300) and an RS-232 cable (use pins 1, 2, 3, 4, 6, 7, 8 and 20; wire pin 2 of one plug to pin 3 of the other and vice versa). (See Fig. 1.)

If you don't know anything about wiring a cable, have the store employees wire it for you. All wiring is direct except for the pin 2 and 3 exchange noted above.

Before you make the big test, be sure that the printer routine on your RES module is the DECW4 version. Section 2.2.1.6 of your Vector Graphic manual tells you how. If you normally use another version, don't panic. Copy your master diskette, then modify the RES module and save it according to section 2.2.1.6. Just copy any of your programs onto this disk and make sure you use only this disk when you access the computer from your remote terminal.

You also have to adjust the baud rate of your computer to match the speed of the 745 (300 baud). Even if you've never opened up your computer, this is one time that you should. As with all electrical appliances, make sure it's unplugged.

Unscrew the four Phillips-head screws (two on each side) on the top part of the case and lift off the top. On one of the printed circuit boards near the rear of the

computer, a series of small switches in the upper left corner will usually be set to 1200. Using a pencil or small screwdriver, pop the switch that is out of line so that it is in line with the others. Next, find the switch labeled 300 and pop that out of line.

When you first open the computer, touch your hand to the metal frame on the left side that acts as a guide for the circuit boards, but don't touch anything else. Some electrical wizards feel that this will ground any loose static electricity in your body and prevent the computer from having a coronary if your hand happens to slip later on in the procedure.

Plug the modem into the wall outlet. Connect its telephone jack to the modular outlet that you already have on the wall. If you don't have a modular jack, Radio Shack sells adapters that you can plug in or screw on to your telephone connector box. Again, if you are mechanically inept, have the phone company install the adapter.

If you have an extra modular cable, you can plug your telephone into the extra modular socket on the back of the DASI 68-01 (a nice feature that saves having to remember to replug the telephone into the wall when you are done with your remote work). Finally, connect the RS-232 cable between the modem and the computer (either side can plug into either device).

### Software

Turn on the computer and bring up BASIC. Enter the program listing and save it. I call this program Remote. The next to last statement loads my menu so that I am ready to run as soon as the ready prompt is flashed on the Mindless Terminal. For your own use, enter the name of your menu program. If you do not have a menu program, enter the name of any other program you have on the diskette.

Run the program. The computer will set itself for input through the RS-232 connector rather than through the Mindless Terminal. All operations can be performed by direct wiring to the connector (as with a Texas Instruments Model 820 KSR printer) or remotely through a modem connected to the computer.

Press the power button on the modem. A red light indicates that all is fine. Go to another phone and dial the first phone number. A ring or two will be followed by a high-pitched sound. Following the procedures that came with the TI 745 instruction book, put the phone handset into the acoustic cuffs of the 745, which is already turned on, according to the manual's instructions.

Once the connection is made, press the on-line key and make sure that the terminal is set for full duplex and high speed (read the manual for details). Type a control-C to set a little interrupt; the computer will follow on the next line with a ready. If nothing happens, make sure that the green carrier detect light is on, and that the terminal is on-line. The switches for full duplex

and high speed will not prevent data from being transmitted, even if they are set incorrectly. But then again, the data will be so garbled that the messages will be meaningless.

#### Operation

From your portable terminal you can do whatever you like. The escape key on the portable terminal will not function. A control-X will bring back the BASIC sign-on message but will preserve whatever program you had in memory. A rubout will generate a back space and the ability to change previously entered information. A control-U will erase an entire line's input. Control-S will stop the computer from sending more information. Hitting any other key will resume transmission with no data loss.

With this particular arrangement, you will receive on the 745 an echo of what the computer receives. Local printing is suppressed, so typing will be a little strange, since there will be a brief delay between typing a character and having it appear on the thermal paper.

To reuse your computer with the Mindless Terminal, hit the computer reset button and type in a B from the keyboard on the Mindless Terminal. The entire system will reboot and allow normal operation of the system.

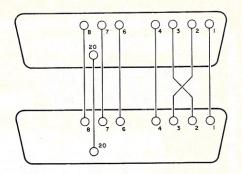
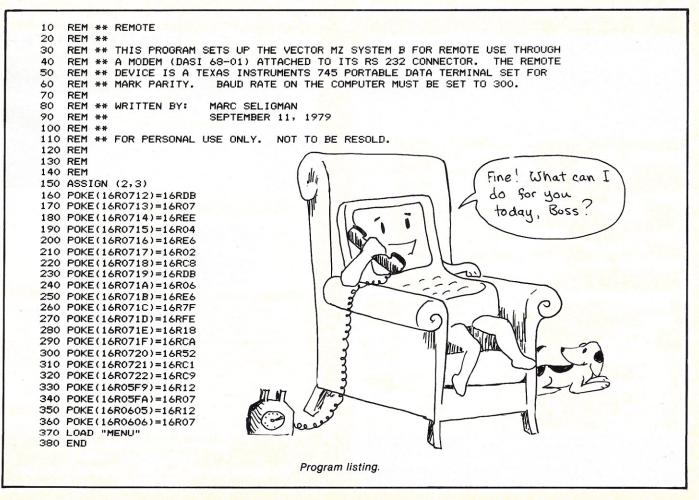


Fig. 1. Pin assignments for RS-232-C cable.

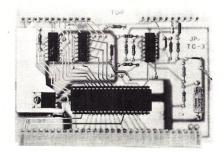
To use the computer from a remote location, make sure that the speed is set to 300 baud and execute PLOADG Remote. Test the system with the portable terminal before you leave the computer far behind. If you accidentally load a program other than Remote, the portable terminal will not work, and if you need to access your computer, you won't be able to do so. Also, turn off the modem when not in use, or else people will never be able to reach you by telephone.

The modem disconnects the computer and hangs up the phone after you terminate remote communication. You can call it again and again without having to reset anything on the computer. It is truly an efficient, low-cost method of accessing your computer from the field.



#### IPC PRODUCTS FOR

**6800** 



#### **High Performance Cassette Interface**

- FAST 4800 Baud Loads 4K in 8 Seconds!
- RELIABLE Error Rate Less Than 1 in 10° Bytes.
- CONVENIENT Plugs Directly Into The SWTPC.
- PLUS A Fully Buffered 8 Bit Output Port Provided.
- LOW COST \$59.95 For Complete Kit.
- OPTIONAL CFM/3 File Manager. Manual & Listing \$19.95 (For Cassette Add) \$ 6.95

TERMS: CASH, MC or VISA; Shipping & Handling \$3.00



Order Phone (505) 294-4623 P.O. Box 5615 Albuquerque, N.M. 87185

#### A Quote on our new Integrated Accounting System (IAS):

.. an excellent value—particularly good are the error checking and data entry procedures—documentation is good (both within the programs and separately provided materials).

> Mr. E. Lindow **Director of Computer Operations** Metric Industries

#### Some of the IAS features include:

Custom Chart of Accounts limited only by available memory (a 32K system will support up to 200 accounts including DOS and BASIC). Financial reports (service or manufacturing) including Income Statement with current and Year-To-Date totals, Balance Sheet and Worksheet. Provision for "Header" and "Subsidiary" accounts. Check register. Account balances at any time. Up to 1100 Accounts Receivable. AR includes read-to-mail bills, automatic aging of AR accounts and posting to General Ledger. Up to 1100 Accounts Payable with check printing. Payroll supports up to 200 employees and permits payment by week, bi-weekly, semi-monthly, monthly, hourly or on salary or <u>any</u> combination thereof. Prints paychecks and W2 forms. Maintains all employee data with full editing. Current, quarterly and Y-T-D employee totals. IAS includes over 30 reports and listings to give you the information you need when you need it. Over 65 programs in

Prices: General Ledger; \$125.00, G.L. plus1 subsystem; \$225.00; G.L. plus 2 subsystems; \$300.00; G.L. plus AR, AP and Payroll subsystems; \$350.00. Manual for IAS is \$20.00 (credited towards purchase). Please include \$3.00 for First Class

> IAS requires 32K of memory, North Star Release 4 or later DOS and BASIC and two disk drives. Printer output is provided for, but not required. Specify video device when



**ECOSOFT** Phone orders only: (317) 253-6828 P.O. Box 68602 Indianapolis, IN 46268

#### September, October Super Special Apple II 16K reg. 1195.00

INTEGRAL DATA SYSTEMS

\$950 440G: Paper Tiger with Graphics; reg. \$1095 2K Buffer

\$1099 **460**: Word Processing Quality reg. 1295

\$1199 460G: IDS 460 w/Graphics reg. 1395

12" Screen w/Glare Cover

18 MHz handwidth

\$895 Centronics 737 High Quality Dot Matrix reg. 995.00 \$535 Apple Silentype cludes interface and reg. 595.00

graphic capabilities

Apple Parallel Int. \$160 reg. \$180 Apple Serial Int. \$175

reg. \$195 Centronics Parallel Int. \$185 reg. \$225

\$295.00 **DOUBLE VISION** DISK II \$525.00 with controller without controller \$445.00 \$325.00 MICROMODEM \$425.00 **PASCAL** LEEDEX MONITOR \$140.00 KG-12C \$275.00

16K RAMS for APPLE II **TRS-80** 

VERBATIM DISKS 10 for

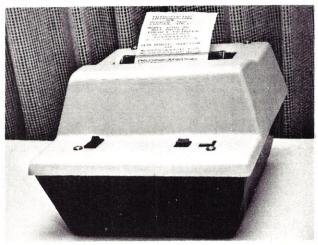
V 105

The Computer Stop 16919 Hawthorne Blvd Lawndale, CA 90260 (213) 371-4010

MON. - SAT.

10-6

#### LOW COST IMPACT PRINTER



48 Column Impact Printer available in KIT form or ASSEMBLED and TESTED, ready to be connected to your computer. Primary features include: Microprocessor controlled and programmable with 32 system level software commands, 96 ASCII characters with upper and lower case, no eye straining print with 9 software selectable sizes from 5 x 7 to larger 10 x 7 and 10 x 14 character fonts, reverse font printing capability, standard parallel and serial interface, baudrate selectable from 110 to 9600 baud, plus many more functions at your command.

Prices for KITS are \$295 (101A-48K) without enclosure and \$325 (101A-48KE) with enclosure. KITS include all electronics, mechanical parts and detailed assembly instructions.

ASSEMBLED and TESTED Impact Printers-prices are: \$325 (101A-48) excluding enclosure, \$355 (101A-48E) with enclosure.

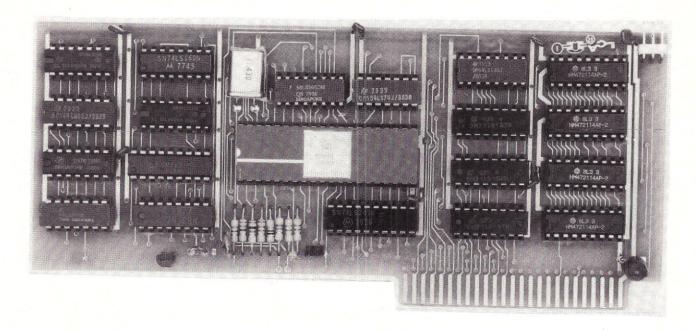
For further information, contact:

COOLSOL, INC. 292

P.O. Box 743, Anaheim, Ca. 92805 Phone: (714) 545-2216 (7 days a week)

#### FOR APPLE II AND APPLE II PLUS COMPUTERS

# **DoubleVision**



# 80 x 24 Video Display with Upper and Lower Case

• is a hardware board that may be plugged into any slot in Apple II or Apple II Plus 32K or 48K Disks • full 128 ASCII character set, including control characters • fully programmable cursor • built in light pen capability • inverse video • full cursor control • works with 50/60Hz • has 2k of its own screen memory • has its own video output jack that must be connected to a monitor (or a high band width black & white TV thru a good RF modulator). Color TV's produce a poor display and are not recommended. • permits you to connect another monitor (or a T.V. set thru RFmod) to the Apple video output jack • displays 24 lines of 80 column text — programmable for different values • permits you to have graphics on Apple video output • video output and Apple video output may be connected to one monitor thru optional video switch • is active only when addressed for reading from or writing to • accepts lower case input from keyboard by use of escape key. (no modification required) or direct use of shift key (1-wire connection from shift key pad to DoubleVision required). • is compatible with the latest version of various word processing software packages. Presently these include Apple-pie 2.0— Programma International, Easywriter Professional system—Informational Unlimited, Text Editor/Formatter—Peripheral's Unitd. (when ordering from these companies, please ask for versions compatible with DoubleVision). All software available from Computer Stop when released. • Peripheral's Unitd. B.I.T.S. and P.I.T.S. and Southeastern Software's "DATA CAPTURE" with Micromodem and communication card. These packages give ability to upload, transfer and download files from remote computers, and all at 80 columns! • Programma Int. latest assembler LISA V:20 will support full 80 column display • is transparent for use with Basic and Pascal • software on disk for easy modification and adaptation for different applications • completely commented source listing of software and hardware schematics available • PASCAL (optional) • becomes the console when installed in Pascal • Permits 80 column text processing with full upper/lower case while using Pascal's editor • must be plugged into slot 3 when operating with Pascal

# Available now at your local computer store.....\$295.00

Call Computer Stop for Store nearest you

Calif. Residents add 6% Sales Tax

Shipping, Insurance, Handling, extra

\*Apple is a Registered TM of Apple Computers, Inc.

Dealer inquiries invited. Contact:

COMPUTER STOP CORP. 2545 West 237th St. Suite L Torrance, CA 90505 539-7671

The Computer Stop 16919 Hawthorne Blvd. Lawndale, CA 90260 (213) 371-4010

MON. - SAT. 10-6

# Address List Program

Machine-language program for 6800 users who want to keep up to date on who's who.

NAME (20 CHARACTERS)
JACKSON; JOHN;
TELEPHONE (11 DIGIT MAX)
3012516486
BIRTH DATE (YYMMDD)
290403
STREET (21 CHARACTERS)
243 AMOS ST.,
CITY;STATE (17 CHARACTERS)
NEWBURG; MO,
ZIP CODE (5 DIGITS)
33557

NAME (20 CHARACTERS)
DAWSON; HAROLD \*;
TELEPHONE (11 DIGIT MAX)
4532875496
BIRTH DATE (YYMMOD)
310427
STREET (21 CHARACTERS)
4730 FULTON RD.,
CITY;STATE (17 CHARACTERS)
JACKSON; MI,
ZIP CODE (5 DIGITS)
76321

NAME (20 CHARACTERS)
YARREL; PHYLLIS,
TELEPHONE (11 DIGIT MAX)
4749763287
BIRTH DATE (YYMMDD)
340823
STREET (21 CHARACTERS)
455 53RD ST.,
CITY:STATE (17 CHARACTERS)
SAN FRANCISCO; CA
ZIP CODE (5 DIGITS)

NAME (20 CHARACTERS)

Example 1. Initial use. Entry at \$0100. Shows initial entries and stops with an exclamation point (!).

- N-Sort by name
- Z-Sort by zip code
- F-List "flagged" entries
- A-Add an entry
- D Delete an entry by sub-command as under S
- B-Sort by birth year
- L-List as currently sorted
- E-Exit to Monitor (or File Manager)
- S Select an entry by sub-command:
  - #-name (#name#)
  - B birth month (B04B)
  - Z-zip code (Z20783Z)

Table 1.

```
FUNCTION (N.B.Z.L.F.E.A.S.D) ? N
                      453 287 5496 310427
DAWSON; HAROLD *
4730 FULTON RD.
                       JACKSON; MI
                                          76321
JACKSON; JOHN
                      301 251 6486
                                    290403
 243 AMOS ST.
                       NEWBURG: MO
                                          33557
YARREL; PHYLLIS
                      474 976 3287 340823
                       SAN FRANCISCO: CA 34567
455 53RD ST.
Example 2. Normal operation. Entry at $00AD. Name sort.
```

C.H. Looney 3406 Notre Dame Street Hyattsville, MD 20783

This machine-language program is for inserting, retrieving, sorting and deleting name, address and birth date information.

The program takes about 1200 bytes of storage. At least 80 entries can be stored in an 8K machine.

Sorting is done by the primitive "bubble" method. It takes about one second to sort 25 entries and about four seconds to sort 50 entries. Sorting can be done by name, birth year or zip code.

Entries can be selected for printing or viewing on a CRT terminal by name, birth month, zip code or "flag." The "flagged" entries are marked by an asterisk after the name. Entries can be deleted after selection by name, birth month or zip code.

Function selection is by single letter input, except for those operations involving selection of a sort field (name, birth month or zip code). The sort field can be as short or as long as desired.

The functions are listed in Table 1.

The program (Listing 1) is particularly valuable to 6800 users without disk capability.

The first section of the program, from

00A3 to 00FF, is an executive to accept commands and branch to the proper areas of the program to accomplish the desired results. Start the program at \$0100 the first time it is used to set up memory space and get first entries. Succeeding uses should enter at \$00AD (EXEC) to add entries, sort, print, delete entries and so on.

The listing was prepared with a disassembler based on one described by Bob Lentz in the May 1979 *Byte*. His disassembler shows jump and branch destinations by address; I have included the capability of adding more conventional name destinations and labels along with comments. You may find the address destinations more helpful in understanding the operation of the program.

My interest in a name/address data-base program was whetted by an article in the October 1978 *Kilobaud* by Wantz and Bateman ("A Useful Address List Program," p. 102). They wrote their program in BASIC, however, and thus took a large amount of memory, leaving only room for about 15 entries in my 8K memory. This program provides space for more than 80 entries in that 8K of memory and sorts the entries in an acceptable time. Ambitious enthusiasts may wish to put in a more advanced sorting program, for both exercise and improvement.

The initialization section is the second

FUNCTION (N.B.Z.L.F.E.A.S.D) ? Z

JACKSON; JOHN 243 AMOS ST.

301 251 6486 290403 NEWBURG; MO 33557

YARREL: PHYLLIS 455 53RD ST.

474 976 3287 340823 SAN FRANCISCO; CA 34567

DAWSON; HAROLD \* 4730 FULTON RD.

453 287 5496 310427 76321 JACKSON; MI

Example 3. Birth year sort.

FUNCTION (N.B.Z.L.F.E.A.S.D) ? B

JACKSON: JOHN 243 AMOS ST.

301 251 6486 290403 NEWBURG: MO 33557

DAWSON; HAROLD \* 4730 FULTON RD.

453 287 5496 310427 76321 JACKSON: MI

YARREL: PHYLLIS

474 976 3287 340823

455 53RD ST.

SAN FRANCISCO; CA 34567

Example 4. Zip code sort.

FUNCTION (N.B.Z.L.F.E.A.S.D) ? F

part of the program. It sets up the area for storage of data from \$0500 to \$1310, allow-

ing for 45 entries. Additional space can be

allocated at \$50 (80 decimal) spaces per en-

ing printing or during a pause.

ending with \$04 (PDATA1-E07E).

The third section, the interrupt routine starting at \$016A, permits stopping the printer on control-S and restarting on control-Q. This is particularly useful on a CRT screen; information can be jotted down as the entire data base is scanned. The interrupt routine also permits returning to the executive by typing in control-C either dur-

The listing section, \$019F through \$01DD, sets up field lengths and branches to the interrupt routine to print the entries. LIST is a subroutine called by the executive and other program sections to print entries one at a time. SWTBUG routines are used throughout this program for input (INCH-E1AC), output (OUTCH-E1D1), printing a space (OUTS-E0CC) and printing a string

The sorting routines starting at \$01DE are based on ideas in "6800" Software Gourmet Guide & Cook Book by Scelbi Computer Consulting, Inc. This book is ideal for the beginning 6800 user and is also useful for the expert to use as a handbook

and reference. The sorting routines use the

primitive bubble sort, but with the relatively

small number of entries, sorting times are

not long. The first part of this section simply

try.

DAWSON; HAROLD \* 4730 FULTON RD.

453 287 5496 JACKSON; MI

310427 76321

Example 5. Flag sort.

FUNCTION (N.B.Z.L.F.E.A.S.D) ? S #YAR#

YARREL; PHYLLIS 455 53RD ST.

474 976 3287 349823 SAN FRANCISCO; CA 34567

Example 6. Selection of name by first three letters.

FUNCTION (N.B.Z.L.F.E.A.S.D) ? S B04B

JACKSON; JOHN 243 AMOS ST.

301 251 6486 290403

NEWBURG: MO

33557

DAWSON; HAROLD \* 4730 FULTON RD.

453 287 5496 JACKSON; MI

310427 76321

Example 7. Selection by birth month (April – 04)

FUNCTION (NJB/Z/L/F/E/A/S/D) ? D Z76321Z

DELETE THIS ENTRY (Y/N)?

DAWSON; HAROLD \* 4730 FULTON RD.

453 287 5496 310427

JACKSON; MI

76321

FUNCTION (N.B.Z.L.F.E.A.S.D) ? N

JACKSON; JOHN 243 AMOS ST.

301 251 6486 290403

NEWBURG; MO 33557

YARREL; PHYLLIS 455 53RD ST.

474 976 3287 340823 SAN FRANCISCO; CA 34567

FUNCTION (N.B.Z.L.F.E.A.S.D) ? E

CFM/3 UER 2.7

Example 8. Deletion by zip code, name sort, return to Manager.

Listing 1.

EXECutive routine - Jumps or branches to routines on basis of input commands

0007 04 44	00117511	OMD 0 1144	n.ce	: :1 50
00A3 81 44	CONTEX	CMP A #44 BNE 00AD	#1D	
00A5 26 06			EXEC	if not, so to EXEC
00A7 7E 03B1		JMP 03B1	DELETE	else, do DELETE
00AA 7E 1780	JCFM			
00AD BD 0300	EXEC	JSR 0300	PURLE	Print CR & LF
00B0 CE 04BD		LDX #0480	#*FUNCTIO	JN load menu index
00B3 BD E07E		JSR E07E	PDHTH1	ON load menu index and print menu set a character
00B6 BD E1AC		JSR EIAC	INCH	set a character
00B9 81 4E		CMP A #4E	#^N	is it an N?
00BB 27 1F		BEQ 00DC		
00BD 81 42		CMP A #42		is it a B?
00BF 27 20		BEQ 00E1	<b>JSORTB</b>	if so, go sort by birth year
00C1 81 5A		CMP A #5A	# Z	is it a Z?
00C3 27 21		BEQ 00E6	JSORTZ	if so, so sort by zip codes
00C5 81 4C		CMP A #5A BEQ 00E6 CMP A #4C	#´L	is it an L?
00C7 27 20		BEG 00E9	JLIST	if so, list entries
ØØC9 81 46		CMP A #46	#^F	is it an F?
00CB 27 2B		BEQ 00F8	JFLAG	if so, list flagged entries
00CD 81 45		CMP A #45	# / F	is it an E?
00CF 27 D9		BEQ 00AA	JCFM	if so, so to Manager
00D1 81 41		CMP A #41	#^A	is it an A?
00D3 27 36		BEQ 0108	RESTRT	
00D5 81 53		CMP A #53		is it an S?
00D7 26 CA		BNE 00A3		
00D9 7E 038C		JMP 038C	SELECT	else, select an entry
00DC BD 01DE	<b>JSORTN</b>		SORTH	go sort by names
00DF 20 0S		BRA 00E9	JLIST	and list entries
00E1 BD 020C	<b>JSORTB</b>	JSR 0200	SORTB	go sort by birth year
00E4 20 03		BRA 00E9	JLIST	and list entries
00E6 BD 01F5	<b>JSORTZ</b>	JSR 01F5	SORTZ	go sort by zip codes
00E9 BD 0300	JLIST	JSR 0300	PCRLF	Print CR & LF
00EC CE 0500		LDX #0500	#DATA	load data index
00EF BD 019F		JSR 019F	LIST	and list the entries
00F2 6D 01		TST X 01		through listing?
00F4 26 F9		BNE 00EF	JLIST+6	if not, continue
00F6 20 B5	JEXEC		EXEC	else, do to EXEC
00F8 BD 0300		JSR 0300	PORLF	Print CR & LF
00FB BD 0276	- / 141 /-	JSR 0276		and list flagged entries
00FE 20 F6		BRA 00F6		
				30 21 120

\*\*\*\*\* START routine - clears desired memory area and adds entries to data base

0100 CE 0500 START 0103 6F 00 LDX #0500 #DATA load data index CLR X 00 and clear memory location so to next location 0106 8C 1311 CPX #1311 #DATEND+1 end of data memory?

1000 6 1 100	5 m 1 1 1 5 -	A 100 A 100 A		
0109 26 F8		BNE 0103	START+3	if not, do it asain
010B CE 0500	RESTRT	LDX #0500	#DATA	load data index
010E BD 02E9		JSR 02E9	FNDEND	move to end of entries
0111 BD 0300		JSR 0300	PCRLF	Print Ch \ LF
0114 86 0D		LDA A #0D	#/CR	load data index move to end of entries print C: \ LF load a CR
0116 A7 00		STA A X 00		and store it
0118 08		TNX		so to next location
0119 C6 14 011B 8D 16		LDA B #14 BSR 0133		name field length
Ø11B 8D 16		BSR 0133	PROMPT	so set a name
011D C6 0A		LDA B #ØA		telephone number field length
011F 8D 12		BSR 0133		
Ø121 C6 Ø6		LDA B #06		birthdate field length
0123 8D 0E		BSR 0133	DOOMDT	
0125 C6 15		LDA B #15	FROMET	so set the date
0127 8D 0A		DCD 0177	DECMOT	street field length so set the address
0127 C6 11		B3K 0122		
		LDA B #11	DOCHET	city/state field length
012B 8D 06		B2K 6122	PROMPT	so set the city/state
012D C6 05		LDA B #05		zip code field length
012F 8D 02		BSR 0133	PROMPT	so set the zip
0131 20 D8		BKH 010B	RESTRI	so back for another one save the index
0133 DF 38	PROMP!	SIX D 38	SHOEX1	
Ø135 C1 14		CMP B #14		is it the name field?
0137 26 03		BNE 013C		if not, check next
0139 CE 0417		LDX #0417	# NAME	else load name index
013C C1 0A		CMP B #0A		is it the telephone field?
013E 26 03		BNE 0143		if not, check next else load name index is it the telephone field? if not, check next else load telephone index
0140 CE 0431				
0143 C1 06		CMP B #06		is it the birthdate field? if not, check next
0145 26 03		BNE 014A		if not, check next .else load birthdate index is it the street field? if not, check next . else load street index is it the city/state field? if not, check next . else load city/state index is it the zir code field? if not, so print else load zir index
0147 CE 044F		LDX #044F	#'BIRTH	.else load birthdate index
014A C1 15		CMP B #15		is it the street field?
014C 26 03		BNE 0151		if not, check next
014E CE 0468		LDX #0468	#'STREET.	else load street index
0151 C1 11		CMP B #11		is it the city/state field?
0153 26 03		BNE 0158		if not, check next
0155 CE 0484		LDX #0484	#'CITY	. else load city/state index
0158 C1 05 015A 26 03		CMP B #05		is it the zip code field?
015A 26 03		BNE 015F		if not, so print
015C CE 04A4		LDX #0484	#'ZIP	else load zip index
015F BD E07E		JSR E07E	PDATA1	print message
Ø162 DE 38		FDX D 38	SAUEX1	reload index
0164 BD 0300		JSR 0300	PCRLF	else load zip index erint messade reload index erint CR & LF now do det the keyboard input
0167 7E 029B		JMP 029B	INPUT	now so set the keyboard input
***** Interru	et routi			and restarting the
		Print	routine or	returning to EXEC
0168 B6 8004	INTRUE	108 8 8884		look at key board address
016D 47		ASP A		any action?
016E 24 1F		BCC 018F	CONTR	if not, continue printing
0170 B6 8005		1 DB B 8885		else load keuboard entru
				is it a Control-C?
0173 81 03 0175 26 03 0177 7E 00AD 017A 81 13		PNE 0179	π 10	if not, check for another
0177 7F 000D	TEXEC1	TMP GGED	EXEC	else return to EXEC
0179 81 13	SEMECT	CMP 8 #13	#/#5	is it a Control-52
017C 26 11		DNE 010E	CONTR	
017E P4 0004	LOOP	TUD 0 0004	CONTE	lock at keyboard address
0101 47	LUUF	DCD 0		look at keyboard address
E1101 9(				

ASR A any action? if not, continue looping 0182 24 FR BCC 017E LOOP Ø184 B6 LDA A 8005 8005 else load keyboard entry 0187 81 A #03 #110 is it a Control-C 0189 27 EC BEQ 0177 JEXEC if so, return to EXEC Ø18B 81 11 CMP A #11 # TQ is it a Control-Q? 26 EF 017E LOOP if not, continue looping 018F A6 00 0191 81 00 LDA A X 00 A #00 set character from memory is it 00? CONTR 0193 26 02 BNE 0197 OUTC if not, so print it else load a space and print it 0195 86 20 LDA A #20 #1SP 0197 BD E1D1 OUTC JSR E1D1 OUTCH so to next memory location 019B 019C 5A 26 CC decrement the counter if not through, set another DEC BNE 016A INTRUP **019E** 39

\*\*\*\*\*\*\*\* LIST routine - sets up field counters and branches to
INTRUP to list name, birthdate, telhone
number and address information

019F	C6	15	LIST	LDA	B #15		CR + name field length
Ø1A1	SD	C7		BSR	016A	INTRUP	go print name
Ø183	BD	EØCC.		<b>JSR</b>	EØCC	OUTS	print a space
01A6	C6	93		LDA	B #03		tel. area code field length
01A8	SD	CØ		BSR	016A	INTRUP	go print area code
<b>0188</b>	BD	EØCC.		<b>JSR</b>	EØCC	OUTS	print a space
<b>Ø1AD</b>	C6	03		LDA	B #03		tel. exchange field length
01AF	SD	B9		BSR	016A	INTRUP	so print exchanse
Ø1B1	BD	EØCC.		<b>JSR</b>	EØCC	OUTS	print a space
Ø1B4	C6	04		LDA	B #04		tel. number field length
0186	SD	B2		BSR	016A	INTRUP	so print number
Ø188	BD	EØCC.		<b>JSR</b>	EØCC .	OUTS	print a space
01BB	BD	EØCC.		<b>JSR</b>	EØCC	OUTS	print another space
Ø1BE	C6	06		LDA	B #06		birthdate field length
Ø1CØ	80	A8		BSR	016A	INTRUP	go print birthdate
Ø1C2	BD	0300		JSR	0300	PCRLF	print CR & LF
0105	C6	15		LDA	B #15		street field length
Ø1C7	SD	A1		BSR	016A	INTRUP	go print street address
0109	BD	EØCC.		<b>JSR</b>	EØCC	OUTS	print a space
01CC	C6	11		LDA	B #11		city/state field length
Ø1CE	SD	98		BSR	016A	INTRUP	go print city/state
Ø1DØ	BD	EØCC		JSR	EØCC	OUTS	print a space
01D3	C6	95		LDA	B #05		zip code field lensth
Ø1D5		93		BSR	016A	INTRUP	so print zip
Ø1D7	BD				0300	PCRLF	Print CR & LF
010A		0300			0300	PCRLF	print CR & LF
Ø1DD	39			RTS			and return

sets up field lengths and starting locations in order to ease the user's problems in directing sorting operations.

The flag routine (\$0276 through \$0299) searches for the flag (an asterisk—\*) and uses LIST to print selected entries. The flag need not be at any particular location as long as it is in the name field. It could precede names for selection, be buried in the name or follow the names to be selected.

The input routine starting at \$029B is used to format the input data, to recognize when input is completed and to permit back-space correction or entry canceling. The exclamation point (!) is used to stop entry and return to the executive. It should be used as the first character in an entry field; otherwise, a partial entry will be made.

Telephone numbers, birth dates and zip codes are expected to fill designated fields, while names and addresses may be truncated by using a comma as the final character. The comma can also be used to blank a field when the data is unknown by typing the comma as the first character in that field. If a field is overrun, the overflow characters will fall into the next field; therefore, you must be careful when filling entries.

Since a comma is used to truncate names and addresses, a semicolon should be used to separate city from state and last name from initials. You can use a return (CR) to terminate an entry and cause the program to consider that entry complete and prepare for the next entry.

The two routines next in line simply print a CR and LF and advise you when the last entry space has been filled.

The rest of the program is based on the excellent ideas put forth by Peter Stark's article on a BASIC editor (see "An Editor for 6800 BASIC Programs," January 1979 Kilobaud Microcomputing, p. 22). In particular, his search and replace routines have been adapted to the needs of this data-base program.

SELECT and DELETE are the two primary routines. Each uses DELIM to set up a delimiter character and READST to set up a string for matching to names, birth months or zip codes in the stored data. The delimiter character must be a number sign (#) for use in selecting names, B for choosing birth months and Z for selecting zip codes.

SELECT will print out as many entries as have matching characteristics with the string. DELETE will ask you whether you wish to delete an entry chosen to match the string. If you do not accept the offered entry, DELETE will go back to get another until all matching entries have been offered.

Listing 2 is a complete machine-code listing of the program followed by a decoded printout of the character strings used as messages. Examples 1-8 show the use of the data-base program.

**** 50RT ro	utines -	name, birth	year and	zip code sort routines
01DE CE 022A	SORTN	LDX #022A		index for sort field length
01E1 86 14 01E3 87 00		LDA A #14 STA A X 00		name sort field length
01E5 86 01		LDB B #01		name field start location
01E7 A7 09 01E9 86 51		STA A X 09 LDA A #51		next name field start
01EB 87 0B		STA A X ØB		
01ED 86 3C		LDA A #3C STA A X 13		distance to next name field
01EF A7 13 01F1 A7 42		STA A X 42	CODT	
01F3 20 2C 01F5 CE 022A	SORTZ	BRA 0221 LDX #022A	SORT	so do the sortins index for sort field length
Ø1F8 86 Ø5		LDA A #05		zip code field length
01FA A7 00 01FC 86 4B		STA A X 00 LDA A #4B		zip code field start location
01FE A7 09		STA A X 09		
0200 86 9B 0202 A7 0B		LDA A #9B STA A X ØB		location of next zip
0204 36 4B		LDA A #4B		distance to next zip
0206 A7 13 0208 A7 42		STA A X 13 STA A X 42		
020A 20 15	CODTO	BRA 0221	SORT	so do the sortins index for sort field length
020C CE 022A 020F 86 06	SURTE	LDX #022A LDA A #06		birthdate field length
0211 A7 00		STA A X 00 LDA A #1F		birthdate field start location
0213 86 1F 0215 87 09		STR 8 X 09		
0217 86 6F 0219 A7 0B		LDA A #6F STA A X ØB		location of next birthdate
021B 86 4A		LDA A #4A		distance to next birthdate
021D A7 13 021F A7 42		STA A X 13 STA A X 42		
0221 CE 0500	SORT	LDX #0500	#DATA	load data index
0224 8C 12C0 0227 27 06	NEREND	CPX #12C0 BEQ 022F		50 index of last possible entry return if at last entry
Ø229 C6 14		LDA B #14		sort field length check to see if at data end
022B 6D 51 022D 26 01		TST X 51 BNE 0230	CKNEXT	if not, continue
022F 39	SRTRET	RTS		else return
0230 DF 38 0232 A6 01	CKNEXT	STX D 38 LDA A X 01		save index load character
0234 A1 51		CMP A X 51		compare with next field
0236 26 0C 0238 08		BHE 0244 INX	CKGTLT	if not same, see which larger else move on
0239 5A 023A 26 F6		DEC B	CUMENTAR	and decrement counter
023C C6 3C			CKIENTIZ	continue if not at field end else so to next field
023E 08 023F 5A		INX DEC B		by advancing step by step
Ø24Ø 26 FC		BNE 023E		keep at it till at next field
0242 20 E0 0244 23 21	CKGTLT	BRA 0224 BLS 0267	HEREND FINEND	and sort next pair of fields if less so to field end
0246 C6 50		LDA B #50 LDX D 38	COUEVI	else bubble sort them by saving the index
0248 DE 38 0248 A6 00	NOTYET	LDA A X 00		and interchanging characters
024C 97 35 024E 86 50		STA A D 35 LDA A X 50	TEMP	between DATA and TEMP locations until they're all
0250 A7 00		STA A X 00	TT. 45	interchansed
0252 96 35 0254 87 50		LDA A D 35 STA A X 50	TEMP	
0256 08 0257 5A		INX		
9250 24 EQ		DEC B BNE 024A	NOTYET	keep at it till done
025A C6 A0	NMINUS	LDA B #A0		and then load the counter to backup two entries
1 025D 5A	MATINOS	DEC B		now so back to last entry
025E 26 FC 0260 8C 0500		BNE 025C CPX #0500	MMINUS #DATA	to see if it needs to move but don't go too far
0263 2D BC		BLT 0221	SORT	if so, go back and sort again
0265 20 BD	FINEND	BRH 0224 INX	NEREND	else continue from here now so to field end
0267 08 0268 5A		DEC B	ETHENE	to backup two entries now so back to last entry to see if it needs to move but don't so too far if so, so back and sort asain else continue from here now so to field end step by step there yet? ok, now so to next sort field step by step
0269 26 FC 026B C6 3C		LUM D #OU	LIMEND	ok, now go to next sort field
026D 08 026E 5A		INX DEC B		ster by ster
GOVE OF EC				once you're there
0271 20 B1 0273 7E 010B	JRES	BRA 0224 JMP 010B	NEREND RESTRT	sort the next pair of fields used as a jump island
0276 CE 0500	FLAG	LDX #0500	#DATA	assed entries data start index CR + name field lensth set a character from memory is it the flas (*)? if so, so back up if not, so to next character decrement the counter
0279 C6 15		LDA B #15		CR + name field length
027B H6 00		CMP A #2A	#**	is it the flas (*)?
027F 27 0F		BEQ 0290	BACK	if so, do back up
0281 68 0282 5A 0283 26 F6		INX DEC B BNE 027B		decrement the counter if not at field end, do again
0283 26 F6 0285 C6 3B		BNE 0278 LDA B #3B		else go to next field
0287 08 0288 5A		INX		ster by ster at end yet?
0288 5A 0289 26 FC		DEC B BNE 0287		at end yet? if not, do it asain then set a character
028B A6 00		IDA A X 88		then set a character if not 00, check this field
028D 26 EA 028F 39	poet:			
0290 09 0291 5C	BHCK	INC B		name field
0292 C1 15 0294 26 FA		CMP B #15	BBCK	through yet?
0296 BD 019F		JSR 019F	LIST	else return back up to start of name field through yet? if not, keep backing else go list entry and look for next flag
0299 20 DE		BKH 0279	FLHG+3	and look for hext flas

#### IMAGINE.

A computer game that has drawn the attention of the national news media.

A computer game that has people around the world clamoring for it.

A computer game that turns your love life into a ménage à trois... you, your mate, and your computer!

That's Interlude—the hottest new software program for personal computers.

But it's more than just a game. It's an experience that will tantalize you...romanticize you...fantasize you...and often surprise you.

Interlude begins with a unique computer interview of the participants to determine their mood. Then it searches its memory to select the best Interlude for the occasion. You may be referred to the instruction manual which describes most of the 106 Interludes, or your instructions may appear on your screen if you've chanced to hit upon one of the many surprise Interludes buried within the program. (When you discover secret Interlude #99, your love life may never be the same again!)

Interlude...it's fun...it's fanciful... it's fantastic. It's the computer game for adults. Are you ready for it?

#### Interlud The Ultimate Experience.

INTERLUDE Dept. K-9	10428 Westpark, Hous-
ton, TX 77042. Rush me	

Name	Age
Address	
City	State Zip
16K) [ \$14.95 f	() TRS-80** (Level Ilor cassette \$\frac{1}{5}\$17.95 for .50 for shipping. Texas sales tax.
☐ My check (payab	le to Interlude) is enclosed.
Charge my Maste	ercharge Uisa
Account No	
Expiration Date	
MasterCharge Bank	Code
Signature(Char	ge customers must sign.)
W 12	ge customers must sign.)

CHARGE CUSTOMERS: Order by phone tollfree! 1-800-231-5768 Ext. 306 (Tex: 1-800-392-2348 Ext. 306)

\*Registered trademark of Apple Computers, Inc.
\*\*Registered trademark of Radio Shack, a Tandy Co.

AVAILABLE FOR IMMEDIATE DELIVERY.

#### **NORTHSTAR™ SOFTWARE**

#### INVENTORY-2TM \$275. with order entry

- Open ended file capacity
- Dual location inventory management
- Invoicing
- Extensive reporting capabilities
- · Full back order capability
- · Optional transaction file

#### \$115. MAILROOMIM

Sophisticated mailing list facility. Data base is flexible enough to permit selection on a complex set of criteria.

#### TEXTURITER IIITM \$125.

A powerful text formatting program for this generation of complex documents.

#### P/M PLANNERTM \$175.

Capital equipment inventory system with preventative maintenance scheduling.

#### INVENTORY-1TM

Useful where the order entry capabilities of INVENTORY-2 are not required and the inventory size does not exceed 500 items.

#### **HOUSEKEEPERTM** \$59.95 Subroutines and utilities.

HOUSEKEEPER IITM \$59.95 More subroutines and utilities.

#### TOOL-1TM

\$29.95

Basic program cross reference utility.

#### DIGITAL MARKETING 2670 Cherry Lane Walnut Creek, CA 94596 (415) 938-2880

INVENTORY 1 & 2, MAILROOM, P/M PLANNER, HOUSEKEEPER I & II, & TOOL-1 are trademarks of the Software Works, Inc. TEXTWRITER III IS A TRADEMARK OF ORGANIC SOFWARE

skakakakak TNPHT v	outine -	- accepts in	eut data ar	nd puts in correct place
029B BD E1AC 029E 81 21	INPUT	JSR E1AC CMP A #21	INCH #′!	get character from keyboard is it an !?
<b>028</b> 0 26 03		BNE 02A5		if not, continue
02A2 7E 00AD 02A5 81 0F		JMP 00AD CMP A #0F	#/10	else do to EXEC is it Control-0?
0287 26 10 0289 CE 0500		BNE 0289 LDX #0500	#DOTO	if not, continue else load DATA index
02AC 8D 3B		BSR 02E9	FNDEND	find end of entries
<b>02RE</b> C6 50 <b>02B0</b> 09	BACKUP	LDA B #50 DEX		set counter for entry space and backup to start
02B1 5A	El le le	DEC B		of current entry
02B2 26 FC 02B4 6F 00		BNE 0280 CLR X 00	BACKUP	if not done, do again clear first location
0286 7E 0111	00117	JMP 0111	RESTRT+6	and start entry again
0289 81 0D 0288 27 86	CUNT	BEQ 0273	JRES	clear first location and start entry again is it a CR? if so, go back to RESTRT is it a BS?
02BD 81 08 02BF 26 0E				is it a BS? if not, continue
02C1 09		DEX		else backur one
0202 50 0203 36		INC B PSH A		space, and save ACC A
02C4 A6 00		LDB B X 00	#ZCD	get a character
02C6 81 0D 02C8 32		CMP A #0D PUL A		is it a CR? restore ACC A
02C9 26 D0 02CB 08		BNE 029B INX	INPUT	if not CR, get keyboard entry else go forward
02CC 5A		DEC B BRA 029B		a space
02CD 20 CC 02CF 81 2C	CONT1	CMP A #2C	#',	and set the entry is it a ,?
02D1 26 0A		BNE Ø2DD	CONT2	if not, continue else load 00
0205 A7 00	HHOEUN	LDA A #00 STA A X 00		and store to fill
02D7 08 02D8 5A		INX DEC B		until field is full full field?
<b>02D9</b> 26 F8		BNE 02D3	HAVECM	if not, repeat else start back for another one
02DB 20 06 02DD 87 00	CONT2	BRA 02E3 STA A X 00	RETURN	else start back for another one store the character
02DF 08		INX		and bump the index counter
02E0 5A 02E1 26 04		DEC B BNE 02E7	CONT3	decrement counter; field full? if not, so CONT3
02E3 BD E0CC 02E6 39	RETURN	JSR EØCC RTS	OUTS	else print a space and return
<b>02E</b> 7 20 B2	CONT3	BRA 029B	INPUT	so for more input
02E9 6D 01 02EB 27 0A	FNDEND	TST X 01 BEQ 02F7	ENDRET	do for more input look at next character if 00, return
02ED C6 50		LDA B #50		else load counter
02EF 08 02F0 5A	ADVINCE	DEC B		and move ahead step by step
02F1 26 FC 02F3 8D 05		BNE 02EF	ADUNCE CKSPAC	if not through, keep advancing so check if at end
02F5 20 F2		BRA 02E9	FNDEND	and see if at next empty spot
02F7 01 02F8 01	ENDRET	NOP NOP		
02F9 39		RTS		do back where you came from
02FA 8C 1310 02FD 27 0C	CKSPAC			end of space (45 entries) if at end, tell user
02FF 39		RTS		else return
***** CR LF r	outine -	- prints a C	R & LF	
0300 DF 38	PCRLF	STX D 38	SAUEX1	store the index
0302 CF 0400		DV #0400	# (CD   F	load messade indev
<b>0305</b> BD E07E <b>0308</b> DE 38		LDX D 38	SAVEX1	Print the CR & LF restore index
030A 39		RTS		and return
***** MEMory	FUL1 Rou			FULL when allocated
			ry space is	
030B CE 0406 030E BD E07E	MEMFUL	LDX #0406 ISR F07F	#'MEM	load message index
0311 7E 1780		JMP 1780	CFM/3	print the messade and return to Manader
***** READ ST	ring rou	utine - acce	ets keyboar	d input of string to be
			d in DATA	
0314 BD E1AC	READST		INCH	get keyboard input
0317 11 0318 27 09		CBA BEQ 0323	EXITES	compare with ACC B if equal, return
031A 81 0D		CMP A #0D	#1CR	compare with HCC B if equal, return is it a CR?
031C 27 05 031E A7 00		BEQ 0323 STA A X 00	EXITES	if so, return else store the character
0320 08		INX		bump the index and
0321 20 F1 0323 39	EXITRS	RTS	KEHUST	so back for another input return
**** FIND ST	ring rou		ches for ST ACC B = 1	RING; if found returns
0704 04 17				
0326 81 23		LDR A D 40 CMP A #23	STRING-1 #/#	⊴et the delimiter is it a #?
0328 27 16 032A 81 5A		BEQ 0340	NFIND	is it a #? if so, so lookins for a name is it a Z?
032C 27 0C		BEQ 033A	ZFIND-2	if so, go looking for a zip
032E 81 42 0330 26 67		CMP A #42	#1B	is it a B? if not, so to EXEC
				if not, so to EXEC don user selection
				birthdate
038C 8D EC	SELECT	BSR 037A	DELIM	set delimiter and STRING load DATA index
038E CE 0500 0391 BD 0300		LDX #0500 JSR 0300	#DATA PCRLF	load DATA index Print CR & LF
		-		



THE

MID: ATLANTIC

COMPUTER

SHOW

WASHINGTON, D.C.

D.C. ARMORY/STARPLEX

# GOT A PROGRAM

The new computers are showing off. Over \$50 million worth of equipment in over 100,000

square feet of space, including the latest software and hardware for business, government, home and personal use. Everything the NCC show has and more will be on display, and you can buy it all right on the spot.

Computers costing \$150 to \$250,000, mini and micro computers, data- and word-processing equipment, telecommunications, office machines, peripheral equipment and services from

leading names in the industry like IBM, Xerox, Radio Shack and Apple will all be there.

There'll be conferences on business uses of small to medium sized computers, and how to make purchasing evaluations.

There'll be robots, computerized video games, computer art and computer music.

Everyone from kids to people who earn their living with computers will have a great time at the largest computer show ever organized in each region.

Admission for adults is \$5. The public is invited, and no pre-registration is necessary.

Don't miss the computer show that THE mixes business with pleasure. Show MID-WEST up for the show. COMPUTER

#### SHOW CHICAGO

McCORMICK PLACE THURSDAY-SUNDAY OCTOBER 16-19

11 A.M. TO 9 P.M. THURS.-SAT. 11 A.M. TO 5 P.M. SUN.

WS. 2167

#### THE NORTHEAST COMPUTER SHOW

#### **BOSTON**

HYNES AUDITORIUM PRUDENTIAL CENTER THURSDAY-SUNDAY NOVEMBER 20-23

11 A.M. TO 9 P.M. THURS.-SAT. 11 A.M. TO 5 P.M. SUN.

THURSDAY-SUNDAY SEPTEMBER 18-21	Produced by National Computer Sho
11 A.M. TO 9 P.M. THURSSAT.	824 Boylston Street, Chestnut Hill, MA
11 A.M. TO 5 P.M. SUN.	Telephone (617) 739-2000.
	Please send me:

	sed the proper amount of \$ onference program.
☐ Hotel registration informati	☐ Exhibitor rental information
se print: Name	
se print: NameAddress	

#### **MORE FOR YOUR RADIO SHACK TRS-80** MODEL I!

- MORE SPEED 10-20 times faster than Level II BASIC.
- Compiled code plus VIRTUAL MEMORY makes your RAM act larger.
- MORE INSTRUCTIONS Add YOUR commands to its large instruction set! Far more complete than most Forths: single & double precision, arrays, string-handling, more.
  - MORE EASE Excellent full-screen Editor, structured & modular programming Optimized for your TRS-80 with keyboard repeats, upper/lower case display driver, single- & double-width graphics, etc.
- MORE POWER Forth operating system Interpreter AND compiler Internal 8080 Assembler (Z80 Assembler also available) VIRTUAL I/O for video and printer, disk and tape (10-Megabyte hard disk available)



#### THE PROFESSIONAL FORTH FOR TRS-80

MMSFORTH Disk System V1.9 (requires 1 disk drive & 16K RAM) . . . . . . just \$79.95\* MMSFORTH Cassette System V1.8 (requires Level II BASIC & 16K RAM) . . . . . . \$59.95\*

#### AND MMS GIVES IT PROFESSIONAL SUPPORT

Source code provided MMSFORTH Newsletter Programming staff available Many demo programs aboard MMSFORTH User Groups

FLOATING POINT MATH (L.2 BASIC ROM routines plus Complex numbers, Rectangular-Polar coordinate conversions, Degrees mode, more), plus a full Z80 ASSEMBLER; all on one diskette . . . \$29.95\*

THE DATAHANDLER, a very sophisticated database management system operable by non-programmers (requires 1 drive and 32K RAM); with manuals ..... \$59.95\*

Other packages under development

#### FORTH BOOKS AVAILABLE

MICROFORTH PRIMER — comes with MMSFORTH; separately . . . . . . \$15.00\* USING FORTH - more detailed and advanc-.....\$25.00\* ed than above ... 

 Software prices are for single-system user license and include manuals. Add \$2.00 S/H plus \$1.00 per additional book; Mass. orders add 5% tax. Foreign orders add 15%. UPS COD, VISA & M/C accepted; no unpaid purchase orders, please.

Send SASE for free MMSFORTH information. Good dealers sought.

MMSFORTH is available from your computer dealer or

MILLER MICROCOMPUTER SERVICES (K10) 255

61 Lake Shore Road, Natick, MA 01760 (617) 653-6136

0394	8D	8E	FLOOP	BSR	0324	FINDST	so find the STRING
0396	5D			TST	В		find one?
0397	26	03		BNE	039C	LOOKCR	if so, go back to CR
0399	7E	00AD	JEXEC2	JMP	00AD	EXEC	else do EXEC
Ø39C	09		LOOKCR	DEX			start backing up
039D	86	99		LDA	A X 00		get a character
039F	81	ØD		CMP	A #0D	#1CR	is it a CR?
03A1	26	F9		BNE	039C	LOOKCR	if not, keep backing
03A3	BD	019F		<b>JSR</b>	019F	LIST	else print entry
03A6	6D	01		TST	X 01		is it the last one?
<b>03A8</b>	27	EF		BEQ	0399	JEXEC2	if so, go EXEC
03AA	80	1310		CPX	#1310	#DATEND	at end of memory?
03AD	26	E5		BHE	0394	FLOOP	if not, look for another
Ø3AF	20	E8		BRA	0399	JEXEC2	else do EXEC

\*\*\*\*\* DELETE routine - deletes one entry based upon user's choice of name, zip or birthdate; dets user confirmation before deleting entry

03B1 BD 037A 03B4 CE 0500 03B7 BD 0324	DELETE RPTDEL	JSR 037A LDX #0500 JSR 0324	DELIM #DATA FINDST	<pre>set delimiter and STRING load DATA index find the STRING find one?</pre>
03BA 5D 03BB 26 02 03BD 20 DA 03BF 09	L00KC	TST B BNE 03BF BRA 0399 DEX	LOOKC JEXEC2	find one?  if so, back up to a CR if not, so EXEC start backing up dot a physician
03C0 A6 00 03C2 81 0D 03C4 26 F9		LDA A X 00 CMP A #0D BNE 03BF	#1CR LOOKC	if so, back up to a CR if not, so EXEC start backing up set a character is it a CR? if not, keep backing print CR & LF load messase index and print messase save the index print the entry set a character from keyboard is it a V? if so, so delete the entry last entry? if so, so EXEC end of memory? if not, check another entry else so EXEC start backing up load a character is it a CR?
03C9 CE 04DD 03CC BD E07E		LDX #04DD JSR E07E	#'DEL PDATA1	load messade index and print messade
03CF DE 38 03D1 BD 019F 03D4 BD F18C		LDX D 38 JSR 019F JSR E18C	SAVEX1 LIST INCH	save the index  erint the entry  det a character from keyboard
03D7 81 59 03D9 27 0B		CMP A #59 BEQ 03E6	#7Y DELET1	is it a Y? if so, go delete the entry
03DB 6D 01 03DD 27 BA 03DF 8C 1310		757 X 01 BEQ 0399 CPX #1310	JEXEC2 #DATEND	if so, go EXEC end of memory?
03E2 26 D3 03E4 20 B3	DELET1	BNE 0387 BRA 0399	RPTDEL JEXEC2	if not, check another entry else do EXEC start backing up
03E7 A6 00 03E9 81 0D	DELETT	LDA A X 00 CMP A #0D	#1CR	load a character is it a CR?
03EB 26 F9 03ED 86 5B 03EF 87 01		LDA A #5B STA A X 01	#/[	if not, keep backing load a [ and store as 1st entry char.
03F1 BD 01DE 03F4 C6 50 03F6 08	CLEAR	JSR 01DE LDA B #50 INX	SORTH	end of memory; if not, check another entry else so EXEC start backins up load a character is it a CR? if not, keep backins load a [ and store as 1st entry char. so SORTN to put this entry last load counter with entry size bump the index clear a character decrement the counter; at end? if not, do asain when done, so EXEC load the counter to set to birthdate location and move it there - through? if not, keep movins else so lookins
03F7 6F 00 03F9 5A		CLR X ØØ DEC B	CL FOR	clear a character decrement the counter; at end?
03FC 20 9B 03S2 C6 20		BRA 0399 LDA B #20	JEXEC2	when done, so EXEC
0334 08 0335 5A	BFIND	INX DEC B	DETUD	birthdate location and move it there - throu⊴h?
0336 26 FC 0338 20 06 033R C6 4R 033C 08 033D 5R 033E 26 FC		BRA 0340 LDA B #4A	NFIND	there - through? if not, keep moving else go looking load the counter to get to zip code location and move it there - through? if not, keep moving now move one more space
033C 08 033D 5A 033E 26 FC	ZFIND	DEC B BNE 033C	ZFIND	zip code location and move it there - through? if not, keep movins
033E 26 FC 0340 08 0341 R6 00 0343 91 41	NFIND	INX LDA A X 00	CTDING	now move one more space load a character
0345 26 25 0347 DF 3A	FOUND1	BNE 036C STX D 3A	NOTE SAVEX	now move one more space load a character match 1st STRING character? if not, do housekeep and return else save index here and here then load STRING index and store it here
0349 DF 3C 034B CE 0041 034E DF 3E		STX D 3C LDX #0041 STX D 3E	TEMPSO #STRING TEMPST	and here then load STRING index and store it here
0352 A6 00	FLOOPI	LDA B X BB	TENESU	and put the 1st char in 800 8
0355 DF 3C 0357 DE 3E		INX STX D 3C	TEMPSO	bump the index and store new index load STRING index
07F0 F4 00		LDX D SE	15115	road Siking index
0358 08 035C DF 3F		LDX D 3E LDA B X 00 INX STX D 3F	TEMPST	and put its 1st char. in ACC B bump its index and store it
0359 E6 00 0358 08 035C DF 3E 035E 11 035F 26 09		LDA B X 00 INX STX D 3E CBA BNE 036A	TEMPST NOTF-2	and rut its 1st char. in ACC B bump its index and store it do characters match? if not, so housekeep and return
0359 E6 80 0350 DF 3E 035E 11 035F 26 09 0361 9C 36 0363 26 EB 0365 DE 38		LDX D 3E LDA B X 00 INX STX D 3E CBA BNE 036A CPX A D 36 BNE 0350 LDX D 3A	TEMPST NOTF-2 SPOIN FLOOP1 SAUEX	and rut its 1st char. in ACC B bump its index and store it do characters match? if not, so housekeep and return else see if at end of STRING if not compare next characters else load original index
9359 88 9350 DF 3E 935E 11 935F 26 09 9361 9C 36 9363 26 EB 9365 DE 3A 9367 C6 01 9369 39		INX D 3E LDA B X 00 INX STX D 3E CBA BNE 036A CPX A D 36 BNE 035A LDA B #01 RTS	TEMPST NOTF-2 SPOIN FLOOP1 SAVEX	bump the index and store new index load STRING index and put its 1st char. in ACC B bump its index and store it do characters match? if not, so housekeep and return else see if at end of STRING if not compare next characters else load original index set ACC B to 1 and return

\*\*\*\*\* NOT Found routine - resets index and sets ACC B to 0 if STRING not found

036A DE 3 036C 08 036D 86 0	NOTE	LDX D 3A INX LDA A X 00	SAVEX	load index and start looking for a CR get a character
036F 81 6 0371 26 F 0373 6D 6	3D =9	CMP A #ØD	#1CR NOTE	is it a CR? if not, look again is next character a 00?
0375 26 F 0377 C6 G 0379 39	PID 30	BNE 0324 LDA B #00 RTS	FINDST	if not, look for STRING adain else set ACC B to 00 and return

\*\*\*\*\* DELIMiter routine - gets and stores the delimiter character used to select name, zip, or birthdate information

			LDX #0040		set index for delimiter
037D	BD	EØCC.	JSR E0CC	OUTS	print a space
0380	BD	E1AC	JSR E1AC	INCH	get the delimiter
0383	16		TAB		Put it in ACC B
0384	87	99	STA A X 0	0	and in indexed location
0386	08		INX		bump the index and
0387	80	8B	BSR 0314	READST	so set STRING
0389	DF	36	STX D 36	SPOIN	store index for end of STRING
<b>038B</b>	39		RTS		and return

#### Listing 2.

**0400** MEMOR **0410** Y FULL NAME **0420** (20 CHARACTERS) 0430 TELEPHONE 0440 (11 DIGIT MAX) 0450 BIRTH DATE 0460 YYMMDD) 0470 EET (21 CHARACTE 0480 RS) CITY;ST 0490 ATE (17 CHARACTE 0480 RS) ZIP COD 0480 E (5 DIGITS) FUN 04C0 CTION (N,B,Z,L,F 04D0 ,E,A,S,D) ? DELETE THIS EN 04E0 04F0 TRY (Y/N)?

### A NEW DIMENSION IN APPLE ADVENTURES

Adventure will never be the same! At last, three dimensional graphic adventures are available. The user moves through three dimensional mazes depicted via the APPLE's hi-res graphics. At every turn, danger lurks. Objects must be found, monsters slain, and incredible problems solved.

Deathmaze 5000 places you on the top floor of a five story building. Each floor is a maze of twisting passageways. Floors are connected by elevators and open pits. You have but one goal. ESCAPE ALIVE! Where is the only door out of this nightmare? Monsters, bats, mad dogs, hunger, and many more horrors will plague your every step as you struggle to escape the most complex adventure ever written.

Labyrinth places you in a maze of gigantic proportions. But you are not alone! A minotaur searches for you, seeking a grisly meal. You must find weapons, spells, and treasures. You must deal with ghosts and cave gnomes. You must avoid the minotaur until the moment is right for the final battle.

SATISFACTION GUARANTEED! All Med Systems Software products come with a two week, money back guarantee. If you are not completely satisfied, return your order within two weeks for a prompt and cheerful refund.

#### **REWARD!**

Deathmaze 5000 is perhaps the toughest adventure ever devised. Few may survive its corridors of death. Six of those who do will win a Deathmaze shirt and their choice of three programs. For details, see our ad in the October '80 Microcomputing or send in the coupon below.

Each program \$12.95, for 32K APPLE II or APPLE II PLUS. 16K TRS-80 Level II

Please send the follow	ing 3-D adventures:
□ Deathmaze	(\$12.95) \$
□ Labyrinth	(\$12.95) \$
	TOTAL \$
	alog of programs and product he Deathmaze contest.
Name	
Address	
City	State Zip
Computer:	
□ TRS-80 16K LII	☐ APPLE II or APPLE II PLUS 32K
□ Mastercard □ \	VISA □ check
MC or VISA #	



TRS-80 Model I

call today!



Level II 16K. 26-1056

Model II





64K, 1-Disk TRS-80 Model II System

We accept check, money order or phone orders with Visa or Master Charge. (Shipping costs added to charge orders).

CHARGE IT

JOMOUTERS Unlimited 1524 OAK HARBOR ROAD, FREMONT, OHIO 43420

Callect

TRS-80 is a Trademark of Tandy Corp.

#### MX-8 RELAY MODULES FOR LOW COST INSTRUMENTATION AND **AUTOMATIC TEST**



- 8 BIT MICROPROCESSER I/O PORT CONTROL.
   MATRIX MODE LATCHES ONLY ONE RELAY.
   MULTIPLEXER MODE LATCHES ONLY ONE
- CLEAR MODE OPENS ALL RELAYS.

  EXPANSION UP TO 8 MODULES

  WITH
- PREWIRED CARD CAGE.
   8 BIT I/O INTERFACE MODULE.
   IEEE 488 BUS INTERFACE MODULE.

Catalogs and detailed applications bulletins from

SYSTEMS

Box 128, Mendon, N.Y. 14506 716-924-3822

#### **INCREASE** YOUR PROFITS.

with a magazine that makes the family computer come alive.

 Software directory for APPLE II. TRS80, ATARI

Software Reviews

 Practical Software Applications for personal computers

•Interesting features and articles



Published quarterly Retails \$4.00, 1 yr. subscription \$12.00

**Dealer Discounts Available- Contact** 

CHRIS LATTER P.O. BOX 466 EL DORADO, CA. 95623

#### THE LOWEST

prices on this high-quality software. Buy direct and save 50%. Now, also available for CBASIC on CP/M and MBASIC on HEATH HDOS.

DATA BASE MANAGER Mod-I \$69 Mod-II \$199

JUNIA BASE MANABER

You can use it to maintain a data base & produce reports without any user programming. Define file parameters & report formats on-line. Key random access, fast multi-key sort, field arith. Jabel, audit log. No time-consuming overlays 500 happy users in a year. Mod-II version with over 50 enhancements.

Mod-I \$69 Mod-II \$149 Invoices, statements, aging, sales analysis, credit checking, form input, order entry. As opposed to most other A/R, ours can be used by doctors, store managers, etc.

WORD PROCESSOR Mod-I \$49 Mod-II \$49

Center, justification, page numbering...Used for letters manuals, and reports. Mod-l version features upper/lower case without hardware change!

The best! Compare and be selective. Form input, 5-digit selection code, zip code ext., sort any field, multiple labels. Who else offers a report writer?

Fast. key random access. Reports include order info. performance summary. E.O.Q., and user-specified reports Many converted their memory to ours!

PAYROLL, A/R. A/P. and GL available for the Mod-II DOS and CP/M

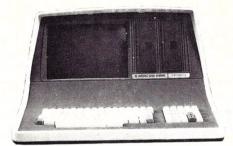
L216, a cassette package of 10 business programs for Level II 16K systems, \$59.

MICRO ARCHITECT, INC.,

96 Dothan St., Arlington, MA 02174

# Try to beat our prices!

SUPERBRAIN by Intertec



Self-contained computer with dual disks and two RS232C ports. Complete with CP/M' 2.2 and BASIC.

32K Double Density, List \$2995.

#### **VIDEO TERMINALS**

NEW EMULATOR (Intertec), List \$895	\$	729
INTERTUBE II, List \$995 ONLY		
SOROC 120, List \$995 SPECIAL		
1Q140, List \$1495	\$1	1149
PERKIN-ELMER 550, List \$997	\$	799
with anti-glare screen, \$1027	\$	829
HAZELTINE 1410, List \$900		749
	\$	849
1500, List \$1225	\$	879
1510, List \$1395	\$1	089
1520, List \$1650	\$1	389
ADDS R-20, List \$995	\$	945
LEAR SIEGLER ADM3A, Assembled	\$	849
TELEVIDEO 912C, List \$950	\$	789
920C, List \$1030	\$	849

#### PRINTERS ANADEX DP-8000 ..... \$ 849

DP-9500, List \$1650	\$1	399
INTEGRAL DATA IP-125 w/1210	\$	724
IP-225 w/1210 & 1250 op., List \$988	\$	834
IP-225 w/tractor, 1210, 1250, 1221		
(2K Buffer), 1241 (graphics) NOW		
PAPER TIGER IDS-440, List \$995		
w/graphics op., incl. buffer, \$1195		
NEC Spinwriters Call for		
TELETYPE 43 KSR	\$1	087
CENTRONICS		
730-1 parallel interface <b>NEW LOV</b>		
737 parallel interface SUPER VALUE		
779 w/Tractor, List \$1350		049
702 w/Tractor, VFU, List \$2480 703 w/Tractor, VFU, List \$2975		995
704 w/Tractor, VFU, List \$2375	92	395 995
<b>TI 810</b> Basic, List \$1895	41	
810/serial & Centronics-style	Υ.	000
parallel interface, List \$1940	\$1	735
810 w/full ASCII (U/LC), Vertical		
Forms Control, Compressed Print	\$1	895
TI 820 KSR, List \$2165	\$1	895
		399
COMPRINT 912 w/parallel interface	\$	559

912 w/serial interface, List \$699 . . . . . \$ 589

RS232 Serial Interface . . . . . . . . . . \$ 89

\$ 699

649

AXIOM IMP I .....

OKIDATA Microline 80, List \$949 . . . .

MICROTEK, List \$750 . . . . .

### NORTH STAR HORIZON® (Call for North Star Specials)

HORIZON 1 KITS

16K, Double Density, List \$1749 ... \$1474
32K, Double Density, List \$1999 ... \$1684
32K, Quad Density, List \$2199 ... \$1869

HORIZON 1 ASSEMBLED & TESTED
32K, Double Density, List \$2695 ... \$2279
32K, Quad Density, List \$2695 ... \$2539

HORIZON 2 KITS

16K, Double Density, List \$2149 ... \$1824
32K, Double Density, List 2399 ... \$2034
32K, Quad Density, List 2779 ... \$2359

HORIZON 2 ASSEMBLED & TESTED
32K, Double Density, List \$3095 ... \$2619
32K, Quad Density, List \$3595 ... \$3049
48K, Double Density, List \$3590 ... \$3039

#### **FLOPPY DISK SYSTEMS**

48K, Quad Density, List \$4090 . . . . . .

64K, Double Density, List \$3830 . . . . .

64K, Quad Density, List \$4330 . . . . . .

\$3469

\$3239

NORTH STAR MDS-A Assembled, List \$899 SPECIAL \$ 715 Kit Version, List \$799 \$ 669
MORROW THINKER TOYS® Discus 2D,
List \$1199 OUR PRICE \$1019*
Discus 2D, dual-drive, List \$1994 \$1694*
Discus 2+2, A&T, List \$1549 \$1319*
Dual Discus 2+2, A&T, List \$2748 \$2335* *Now includes CP/M® 2.2
MICROMATION Megabox, DD w/
8" drives, 1-megabyte, List \$2295 \$1949
2-megabyte, List \$3095 \$2629
MICROPOLIS 1041 MacroFloppy®
w/enclosure (no P.S.), List \$695 \$ 625
1042 MacroFloppy w/case & AC P.S \$ 709
1053 Dual MetaFloppy® , List \$1895 \$1695

#### VIDEO BOARDS I/O Mapped

SD COMPUTER VDB-8024, kit, List \$370 \$319
Assembled, List \$470 \$ 399
XITEX SCT-100K, Kit ONLY \$154.95
SCT-100A Assembled \$174.95
SSM VB2 I/O, Kit, List \$169 \$ 144
Assembled & Tested, List \$234 \$ 199
Memory Mapped
Memory Mapped SSM VB1C, 16x64, Kit, List \$179 \$145 Assembled & Tested, List \$242 \$196
SSM VB1C, 16x64, Kit, List \$179 \$145 Assembled & Tested, List \$242 \$196
SSM VB1C, 16x64, Kit, List \$179       \$145         Assembled & Tested, List \$242       \$196         SSM VB3, 80-Char., 4MHz, Kit, List \$399       \$339         4 MHz, A&T, List \$464       \$394
SSM VB1C, 16x64, Kit, List \$179 \$145 Assembled & Tested, List \$242 \$196

#### ESCON CONVERSION FOR IBM SELECTRIC

Complete w/microprocessor controller and power supply. Factory built. User installs solenoid assembly or it can be done at Escon factory at nominal cost.

Parallel (TRS-80, Sorcerer, etc.), \$575 \$514
RS232 Standard Serial, List \$599 ..... 534
IEEL-488 (for PET), List \$660 ..... 584
TRS-80 Cable ..... 25

#### **CPU BOARDS**

(assembled unless noted)

(dobernbled diffeed fields)	
NORTH STAR Z80A (ZPB-A/A), \$299	\$254
CROMEMCO 4 MHz (ZPU-W), List \$395	\$335
4 MHz (SCC-W), List \$450	\$382
INTERSYSTEMS (formerly Ithaca Audio	)
new Series II Z-80, 4 MHz, List \$395	\$349
SSM CB1 8080 A&T, List \$219	\$186
CB1A Kit, List \$159	\$135
CB2 Z-80, A&T, List \$275	\$234
CB2 Kit, List \$210	\$179
<b>DELTA</b> Z-80, with I/O	\$289
SD SBC-100, List \$350	\$298 †
SBC-100 Kit, List \$295	\$250 †
SBC-200, List \$400	\$332 †
SBC-200 Kit, List \$320	\$272 †

#### **MEMORY BOARDS**

### 32K SD ExpandoRAM Kit ONLY \$249<sup>†</sup>

ONLY \$159 without RAM chips

† Get \$25 rebate from SD Computer when you buy any of their products prior to October 31, 1980.

NORTH STAR 16K Dynamic RAM Board, A&T (RAM-16-A/A), List \$499 16K Kit Version, List \$449 SPECIAL 32K A&T (RAM-32/A), List \$739 32K Kit, List \$669 SPECIAL CROMEMCO 16KZ-W, List \$495	\$420 \$299 \$620 \$499
64KZ-W, List \$1795	1485
MEASUREMENT SYSTEMS & CONTRO	OLS
(Guaranteed performance, incl. labor/parts DM6400 64K Board w/all 64K, \$795	1 yr) \$ <b>659</b>
DM4800 with 48K, List \$695	
DM3200 with 32K, List \$595	
DMB6400 64K Board w/all 64K	\$859
DMB4800 with 48K	\$789
MORROW SuperRAM — all static, all A8	
16K, 4 MHz or 2 MHz, List \$349	\$299
32K, 4 MHz, List \$699	\$629
16K Memory Master, List \$399	\$339
24K Memory Master, List \$549	\$465
INTERSYSTEMS (formerly Ithaca Audio)	
8K Static 2 MHz, A&T, List \$165	\$149
8K Static 4 MHz, A&T, List \$195	\$176
16K Static 2 MHz, A&T, List \$475	\$427 \$445
16K Static 4 MHz, A&T, List \$495	\$895
64K Dynamic, List \$995	9030
CALIFORNIA COMPUTER	¢250
16K Static, A&T, List \$349.95	<b>9209</b>

#### FLOPPY DISK CONTROLLER BOARDS

NORTH STAR, DD, Kit, List \$399 Assembled, List \$499	\$329 \$399
MORROW Disk Jockey 1, A&T (\$213) .	\$189
Disk Jockey 2D, A&T, List \$479	\$429
SD Versafloppy 1, Kit, List \$250	\$212
Versafloppy II, DD Kit, List \$350	\$297
Versafloppy II, DD, A&T, List \$430	\$365
DELTA double density A&T (\$385)	\$345
CONDUCTOR, double density A&T	\$269
INTERSYSTEMS FDC-2, A&T, \$495	\$439
MICROMATION Doubler, DD, A&T	\$399
TARBELL Floppy Disk Interface Kit	\$199
double density, A&T, List \$495	\$444

SHIPPING AND INSURANCE: Add \$2.50 for boards, \$6 for Selectric Converter or Floppy Disk Drives, \$7.50 for Floppy Disk Systems, \$15 for Horizon. SHIPPED FREIGHT COLLECT: SuperBrain, Centronics and T.I. printers. Contact us for shipping information on other terminals and printers.

Above prices reflect a 2% cash discount (order prepaid prior to shipment). Add 2% to prices for credit card orders, C.O.D.'s, etc. Prices are subject to change and offers subject to withdrawal without notice.

— WRITE FOR FREE CATALOG —

# MiniMicroMart, Inc. 238

# Upgrading the Heath H8 With a Z-80 Microprocessor

#### Now that Heath has boarded the Z-80 bandwagon, keep in step with the HZ8 adapter.

Patrick Swayne 290 Springdale Sebastopol, CA 95472

When the Heath Company decided to get into the hobby computer business, the 8080 was the most popular micro, and thus the most logical choice for their CPU. But the Z-80 has since eclipsed it in popularity, and now Heath has joined the

parade by introducing their own Z-80-based machine, the H89. This computer uses the same disk and cassette operating systems as the H8. Currently, the only software available for it is 8080 software, but sooner or later software will appear that takes advantage of the Z-80's expanded instruction set. Over 15,000 H8 owners may be left behind as a result.

Photo 1 shows my solution to this problem. It is a Z-80 adapter that mounts piggyback onto the H8 CPU board. It plugs into the sockets normally occupied by the 8080 CPU, the 8238 (or 74S438) system controller and the 8224 clock driver. No modifications are required on the CPU board itself, and at any time you can remove the adapter and replace the original ICs. It can be built for about \$30 to \$40, including the Z-80 (which has dropped to less than \$15 at some mailorder houses).

#### How the Adapter Works

The schematic of the adapter is shown in Fig. 1. In this circuit, the original CPU and system controller are replaced by a Z-80, six commonly available TTL chips, a capacitor and some resistors. (Two of the TTLs and the capacitor may be eliminated if the optional section is not built.) The clock driver is also shown because some connections were made to it. (A socket for the clock driver was included in the actual assembly to make these connections possible, even though it is still electrically on the CPU board.)

This circuit effectively emulates all of the signals normally produced by the 8080 and 8238 that are used by the H8. This is easy to accomplish because Heath chose to use the fully decoded 8238 system controller signals, rather than the undecoded status or control signals (except M1) that are multiplexed onto the data bus of the 8080.

You can produce those signals by simply ANDing together the appropriate Z-80 outputs. For example, the MEMR (memory

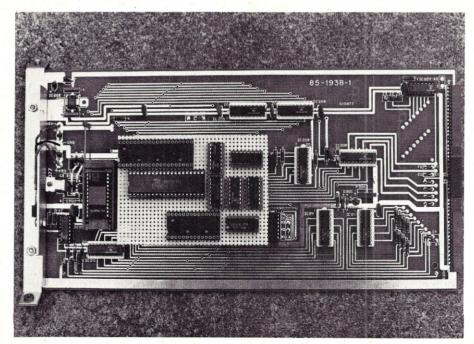


Photo 1. H8 CPU board with the adapter plugged in. The Z-80 (D780C) and some TTL ICs replace the original 8080 and 8238. I placed two extra ICs for the optional section, which I designed after I took this photo, in the lower-left corner of the perfboard. The Textool socket to the left of the adapter is for testing homemade ROM monitors.

read) signal is produced by ANDing the MREQ (memory request) and RD (read) outputs. The NOR gates on the schematic are used as negative AND gates in this application (except those used as inverters).

Noninverting OR gates (such as the 74LS32) could have been used, eliminating the need for inverters at the outputs of the NORs, but the chip count would not have been reduced, since the circuit requires at least five ORs and seven inverters. I chose to use 74LS02s because they are more readily available. Pull-up resistors are required at each of the four memory and I/O control outputs of the Z-80, because they are Tri-state and might, at some time, be undefined.

Deriving the 8238-type memory and I/O control signals was easy, but some of the others are not so obvious. The INTA (interrupt acknowledge) signal is derived by ANDing the IORQ (I/O request) and M1 (first machine cycle) outputs. The H8 uses an M1 signal and decodes it by ANDing the 8080's PD<sub>5</sub> and SYNC outputs. Since the Z-80 already has an M1 output, I simply ran it (through an inverter) to the SYNC input of the 8224 and tied PD5 (actually, D5 on the 8238) high through a resistor.

The WAIT input on the Z-80 is the same as the READY input on the 8080, except that it

does not have to be timed, so I connected the raw RDYIN input at the 8224 to the Z-80 WAIT input. The Z-80 INT, BUSRQ and BUSAK signals are just inverted counterparts of the 8080 INT, HOLD and HLDA pins, so I connected them together through inverters. The NMI (non-maskable interrupt) on the Z-80 is not used, so I tied it high. (Later on, I may write a monitor that uses that interrupt to return to monitor control from a user program, which would make possible debugging a program that had interrupts disabled.)

The HALT and RFSH outputs of the Z-80 are not needed, and were left unconnected. The address pins on the Z-80 were connected to the corresponding pins on the 8080 socket, and the data pins go to the DB pins on the 8238 socket.

The Z-80 does not produce a counterpart to the 8080 INTE (interrupt enable flip-flop) output. The H8 uses that signal to light an LED on the front panel and to operate the single instruction (SI) button. INTE is produced by the optional section of the circuit, and non-machine-language hackers who never use the SI button may leave that section out and tie pin 16 on the 8080 socket high instead. If you do that, the SI button will do nothing, and the ION light will always be on.

The INTE output of the 8080 is set or reset according to whether interrupts are enabled or disabled. Interrupts may be enabled and disabled by software, using the El and DI instructions, and are always disabled when the processor receives an interrupt. The HZ8 adapter circuitry responds only to El and Dl. but that is sufficient to achieve normal operation of the H8. It does this by examining the data bus at M1 time, when op codes are fetched.

The El instruction in binary is 11111011, and DI is 11110011. Bit 3, the only one that changes, goes to the data input of a D-type flip-flop, while the others, along with M1, are used to clock the data through when they are all present. Capacitor C1 slows the clocking down just enough to ensure that D<sub>3</sub> has settled down before it is sampled.

#### Single Stepping

Before I designed the INTE circuitry on the adapter, I looked into various software single-step schemes, which I considered using, and found that they are all deficient in some way. Most cannot handle certain instructions, and all require considerably more code than the Heath method. The H8 can single-step through all of the 8080's instructions, and, with my adapter, through all of the Z-80's codes in only a few bytes of

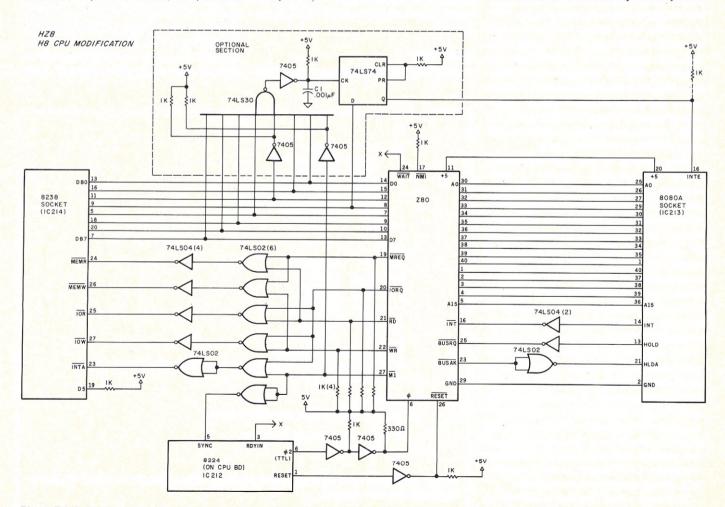


Fig. 1. Z-80 adapter circuit. Connect the points marked "X"; don't tie INTE (pin 16) on the 8080 socket high if optional section isn't built.

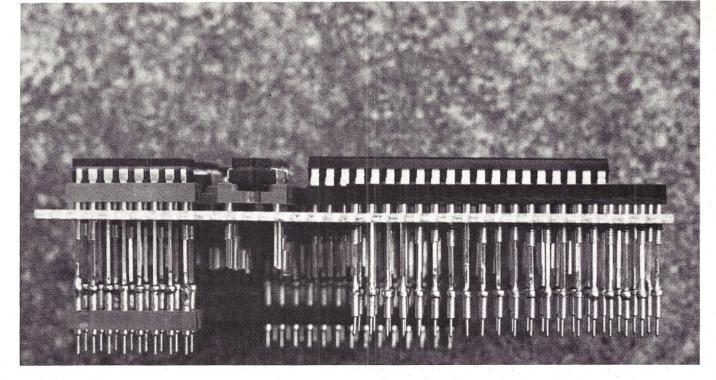


Photo 2. Side view of adapter board shows the frameless socket pins attached to the ends of the wire-wrap pins, using an ordinary

framed socket (left) for alignment. If pins remain at full length, the CPU card won't fit in the first motherboard position.

code.

When you press the SI on the H8 front panel, the monitor jumps to a routine that first disables interrupts, bringing the INTE output low. Then data is written to a port which causes the output of a flip-flop to go high. This signal goes to a NAND gate, the output of which will produce a level 2 interrupt when its other input goes high. That input is controlled by two flip-flops whose data is the INTE signal, with M1 used as the clock. It takes two M1s to clock the current value of INTE to the NAND gate.

After writing to the port mentioned above, the software restores all user registers and flags (previously saved when entering the monitor mode). It then enables interrupts, bringing INTE high, and jumps to the user program. That jump sends out one M1 pulse, and the first user instruction sends out another, allowing the INTE signal to generate an interrupt. The processor allows the current instruction to finish, and then control is returned to the monitor. In this way, one user program instruction is executed each time you press the SI button.

The single phase system clock required by the Z-80 is a special case. It could be supplied by the Ø2 (TTL) output of the 8224, except that it requires a greater voltage swing than TTL. The signal must go from a low of no more than 0.8 volts to a high of no less than 4.4 volts (with a 5 volt supply). I solved this problem by running the clock through two gates of a 7405 open collector inverter, with pull-up resistors on the outputs.

To ensure a fast rise-time to the higher-than-normal voltage, a 330-ohm resistor

pulls up the input to the Z-80. Another gate of the 7405 is used to invert the 8224 RESET to supply the Z-80's inverted version of the signal, and the rest are used in the optional section.

#### Construction

Using the wire-wrap technique, I built the

ICs

adapter on a 3  $\times$  4 inch piece of standard perfboard with 0.1 inch spaced holes. I placed 40-pin, 28-pin and 16-pin wire-wrap sockets on the boards so that their pins are directly over the holes in the 8080, 8238 and 8224 sockets in the CPU board. The Heath-supplied X-ray view of the PC board can be used to align the sockets. Another 40-pin

105		
Qty.	Type	Function
2	74LS02	Quad 2-Input NOR
1	74LS04	Hex Inverter
1	74LS30	8-Input NAND*
1	74LS74	Dual D-type Flip-Flop*
1	7405	Hex Open Collector Inverter
1	Z80	Microprocessor
*Optio	onal	
-		
Socke	ets	
Qty.	Pins	Augat Part No.
	14 WW	514-AG10F
6 (4)	16 WW	516-AG10F
1	28 WW	528-AG10F
2	40 WW	540-AG10F
1	16 F	716-AG4D
1	28 F	728-AG4D
1	40 F	740-AG4D
		F=Frameless
	•	
		pin standard or wire-wrap sockets are also temporarily required to
moun	t frameless	s socket pins.
Misco	llaneous	
WIISCE	iiaiieous	
1 Dale	No. LDP1	6-02-102G resistor pack or equivalent
12 1k	ohm resist	ors and 1 330 ohm resistor
3 × 4	inch perfb	oard
Wire		

Table 1. HZ8 parts list. I built the prototype using 16-pin sockets for 14-pin ICs due to availability (or lack thereof).

wire-wrap socket, which holds the Z-80, was installed between the other 40-pin and 28-pin sockets. Placement of the other sockets is not important, but wire lengths should be kept short.

Power and ground for the TTL were derived from the VCC and ground pins of the 8238 socket, except for the 7405, which gets its ground and power from the 8224 socket. The two extra chips for the optional section were added later, and get their power from the Z-80 socket. For the pull-up resistors, I used a resistor package containing 15 resistors, all 1k ohm, connected internally to a common pin. To make the 330 ohm resistor, three resistors in the package were paralleled. Discrete resistors may also be used.

After being wired, the circuit should be checked with an ohmmeter or continuity tester for correctness, because when it is finished it will be difficult to make changes. To make it possible to plug the adapter into the CPU board, frameless socket pins were soldered to the ends of the wire-wrap pins on the 8080, 8238 and 8224 sockets. Frameless sockets are socket pins that are installed on an aluminum frame that is removed after the sockets are soldered into a PC board.

To connect these pins to a wire-wrap socket, they should first be removed from the frame and plugged into an ordinary framed socket. That will hold them in place while they are soldered to the wire-wrap pins.

Photo 2 shows how the pins are connected. If the wire-wrap pins are left their full length, the CPU card with the adapter installed will not fit in the first motherboard position. If the wire-wrapping is kept close to the board, and all pins are cut so that they protrude no more than 1/4 inch from the perfboard (before the frameless pins are attached), then the board will just fit in the first slot.

Those H8ers capable of making their own PC boards and using that technique would not have a thickness problem. The frameless socket pins could be soldered directly to the back of the PC board over the protruding pins of the sockets.

#### Installation and Checkout

The adapter cannot be plugged into the CPU board unless the 8080, 8238 and 8224 sockets on the board are all of the flat, low-profile type. If any are not, they will have to be changed. The 8080 and 8238 ICs should be stored in anti-static material (foil will do) while they are not in use.

After the TTL ICs, resistor pack and 8224 are installed, the adapter can be plugged into the CPU board. If the CPU is to be used in the second motherboard slot, framed sockets can be plugged onto the socket pins to protect them before the adapter board is plugged in. Then the Z-80 can be in-

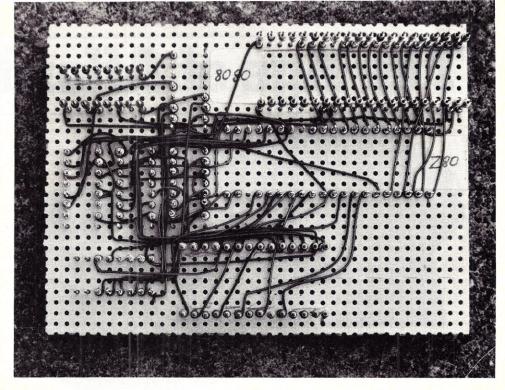


Photo 3. Bottom view of the adapter showing wire-wrap technique.

stalled, and the CPU board replaced in the computer.

Checkout is simply a matter of turning the computer on. If PAM-8 (the front-panel monitor) signs on normally by lighting the displays and beeping the horn, everything else should also run normally. If there is trouble, the first area to check is the wiring and then the chips.

#### The Z-80

The 8080 instruction set consists of 244 individual op codes. Like most 8-bit processors, each op code consists of one byte, making 256 the total number of codes possible. The Z-80, however, uses four of the 12 op codes not used by the 8080 as the first byte of several two-byte op codes. You can think of these as 16-bit op codes that are fetched one byte at a time. In that sense, the Z-80 is a predecessor of the Intel 8088, a 16-bit micro designed to use an 8-bit data bus.

The two-byte op codes are used for a variety of purposes, including 16-bit arithmetic, bit manipulation, working with two index registers and some versatile block move and search instructions. These last types are an elementary form of microcode, another way in which the Z-80 looks forward to the big machines.

Two of the Z-80's 16-bit instructions adversely affect the operation of the optional section of the adapter circuit during normal running (but not during single stepping). The second bytes of these instructions, SET 6,E and SET 7,E, have the same binary code as DI and EI. Since the Z-80 issues an M1 pulse for each byte of two-

byte op codes, the adapter circuitry sees the second bytes of those SET instructions as DI and EI. The result is that the front panel ION light may be lying if those instructions are in the code. Upon return to monitor, however, an EI instruction is encountered, and proper indication is restored.

The Z-80 uses five of the other eight unused 8080 op codes for an unconditional and four conditional relative jumps. In the 8080, all jumps require three bytes — one for the op code and two for the address. With the Z-80 relative jumps, a single byte following the op code specifies the jump destination as a signed 8-bit offset added to the program counter.

Another of the unused 8080 codes is a special relative jump instruction that decrements the B register each time it is executed and jumps if B is greater than zero. The remaining two extra op codes are used to switch between alternate sets of the six general-purpose registers and alternate flag registers and accumulators. In all, the Z-80 has about 700 op codes in its instruction set.

#### A Final Note

Those who use Heath's cassette assembler, HASL-8 version 4.01.01 or 4.02.00, will have to make a patch before it will work on a Z-80. The program contains one of the 8080's unused op codes, 40 (octal), which is one of the Z-80's relative jumps. To correct this bug in version 4.01.01, change the contents of address 055.265 (split octal) to 000. 

To correct version 4.02.00, change 055.365 to 000. ■

# The Age of Affordable Pers



single board at a cost of under \$300. The Superboard II received rave reviews by microcomputer experts such as:

"We can heartily recommend the Superboard II computer system for the beginner who wants to get into microcomputers with a minimum of cost. Moreover, this is a 'real' computer with full expandability."

POPULAR ELECTRONICS MARCH, 1979

"The Superboard II weighs in at \$279 and provides a remarkable amount of computing for this incredible price."

KILOBAUD MICROCOMPUTING FEBRUARY, 1979

"The Superboard II and its fully dressed companion the Challenger 1P series incorporate all the fundamental necessities of a personal computer at a very attractive price. With the expansion capabilities provided, this series becomes a very formidable competitor in the home computer area." INTERFACE AGE APRIL, 1979

"The graphics available permit some really dramatic effects and are relatively simple to program...The fact that the system can be easily expanded to include a floppy means that while you are starting out with a low-cost minimal system, you don't have to throw it away when you are ready to go on to more complex computer functions. At \$279, Superboard II is a tough act to follow." RADIO ELECTRONICS JUNE, 1979

"The Superboard is an excellent choice for the personal computer enthusiast on a budget." BYTE MAY, 1979

Since the introduction of Superboard II, the cost of personal computers has actually gone up with new models by major manufacturers ranging from \$1000 to well over \$4000 due to the general cost of inflation and the increasing functionality included in these computers. Today Cleveland Consumer Computers is offering you the original Superboard II at its original price of just \$279. In today's economy this is by far the best buy

in personal computing ever!

The Superboard II can entertain your whole family with spectacular video games and cartoons, made possible by its ultra high resolution graphics and super fast BASIC. It can help you with your personal finances and budget planning, made possible by its decimal arithmetic ability and cassette data storage capabilities. It can assist you in school or industry as an ultra

powerful scientific calculator, made possible by its advanced scientific math functions and built-in "immediate" mode which allows complex problem solving without programming! This computer can actually entertain your children while it educates them in topics ranging from naming the Presidents of the United States to tutoring trigonometry — all possible by its fast extended BASIC, graphics and data storage ability.

The machine can be economically expanded to assist in your business, remotely control your home, communicate with other computers and perform many other tasks via the broadest line of expansion accessories in the microcomputer industry.

This machine is super easy to use because it communicates naturally in BASIC, an English-like programming language. So you can easily instruct it or program it to do whatever you want, but you don't have to. You don't because it comes with a complete software library on cassette including programs for each application stated above. Ohio Scientific also offers you hundreds of inexpensive programs on readyto-run cassettes. Program it yourself or just enjoy it; the choice is yours.

The Superboard II comes fully assembled and tested. It requires +5V at 3 Amps and a visco or TV with RF converter to be up \$279.00

#### Standard Features:

- Uses the ultra powerful 6502 Microprocessor.
- 8K Microsoft BASIC-in-ROM. Full feature BASIC runs faster than currently available personal computers and all 8080 based business computers.
- 4K static RAM on board expandable to 8K.
- Full 53-key keyboard with upper/lower case and user programmability.
- Kansas City standard audio cassette interface for high reliability.
- Full machine code monitor and I/O utilities in ROM.

# onal Computing is Still Here.



Direct access video display has 1K of dedicated memory (besides 4K user memory), features upper case, lower case, graphics and gaming characters for an effective screen resolution of up to 256 x 256 points. Normal TV's with overscan display about 24 rows of 24 characters without overscan up to 30 x 30 characters.

#### **Optional Extras:**

- Available 610 expander board features up to 24K static RAM (additional), dual mini-floppy interface, and an OSI 48 line expansion interface.
- Assembler/Editor and Extended Machine Code monitor available.
- 630 I/O Expander. RGB color and NTSC composite color outputs with up to 16 colors, Dual 8-axis joystick interface, AC remote control interface which mates with AC-12P, home security interface which mates with the AC-17P, 16-line parallel I/O interface, 16-pin I/O bus interface which allows the connection of parallel I/O lines or high speed analog I/O module, or a PROM blaster or solderless interface prototyping board, programmable sound generator and program selectable modem and high speed printer ports, and more.

Freight Policies All orders of \$100 or more are shipped freight prepaid. Orders of less than \$100 please add \$4.00 to cover shipping costs. Ohio Residents add 5.5% Sales Tax.

Guaranteed Shipment Cleveland Consumer Computers & Components guarantees shipment of computer systems within 48 hours upon receipt of your order. Our failure to ship within 48 hours entitles you to \$35 of software, FREE.





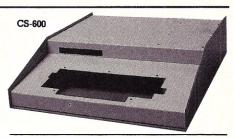
Hours:

Call Monday thru Friday 8:00 AM to 5:00 PM E.D.T.

#### Software:

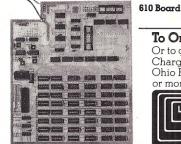
Ohio Scientific and independent suppliers offer hundreds of programs for the Superboard II, in cassette and mini-floppy form. Here is a sampling of popular Ohio Scientific programs for the Superboard II.

EDUCATIONAL PROGRAMS	SBII & C1P	Price
BASIC Tutor Series	SCE-336	\$35.00
Clock Tutor	SCE-353	6.50
Continents Quiz	SCE-332	6.50
Definite Integral	SCE-326	6.50
French Drill & Tutor	SCE-339	6.50
German Tutor & Drill	SCE-342	6.50
	SCE-324	9.00
Hangman (8K)		
Log Tutors 1-3	SCE-344	6.50
Math Blitz	SCE-329	6.50
Math Intro	SCE-319	6.50
Mathink	SCE-337	9.00
Matrix Tutors 1-3	SCE-345	6.50
Metric Tutor & Quiz	SCE-335	6.50
Spanish Drill & Tutor	SCE-352	6.50
Spelling Quiz	SCE-333	6.50
Trig Tutor (8K) I & II	SCE-318	6.50
BUSINESS PROGRAMS	552 515	0.00
Address Book	SCB-523	0.00
		9.00
Advertisement Demo	SCB-520	6.50
Inventory Demo	SCB-518	6.50
Mailing List (8K)	SCB-524	6.50
Straight & Constant Depreciation	SCB-500	9.00
Time Calculator	SCB-525	9.00
PERSONAL PROGRAMS	DOD-020	3.00
	COD FILE	0.00
Biorhythm	SCP-716	9.00
Calorie Counter	SCP-708	6.50
Checking Account	SCP-719	9.00
Loan Finance	SCP-717	6.50
Personal Calendar	SCP-718	6.50
Savings Account	SCP-720	9.00
GAME PROGRAMS	DCF-720	3.00
Baseball I	SCG-975	6.50
Black Jack	SCG-955	6.50
Civil War	SCG-977	6.50
Destroyer	SCG-951	6.50
High Noon	SCG-960	6.50
	SCG-979	
Hockey		6.50
Lander	SCG-925	6.50
New York Taxi	SCG-956	6.50
Poker	SCG-962	6.50
Racer	SCG-949	6.50
Space War	SCG-942	6.50
Star Trek	SCG-946	
		6.50
Star Wars	SCG-926	6.50
Tic-Tac-Toe	SCG-945	6.50
Tiger Tank	SCG-950	14.00
		3 4100



#### Hardware:

Superboar	rd II	
	as specified in the advertisement.	\$279
610 Board	For use with Superboard II and	
	Challenger 1P, 8K static RAM ex-	
	pandable to 24K or 32K system total.	
	Accepts up to two mini-floppy disk	
	drives. Requires +5V@4.5 amps.	298
Mini-Flop	py Disk Drive	
	Includes Ohio Scientific's PICO	
	DOS software and connector cable.	
	Compatible with 610 expander	
	board. Requires + 12V@ 1.5 amps	
	and +5V@0.7 amps.	299
630 Board		229
AC-3P	12" combination black and white	
	TV/video monitor.	159
4KP	4K RAM chip set.	79
PS-005	5V 4.5 amp power supply for	,,
	Superboard II.	35
PS-003	Mini-floppy power supply.	29
CIP Sams	C1P/Superboard II Manual.	8
OS-65D	V3.2 Disk Operating System with	ď
	9-digit extended BASIC, random	
	access and sequential files.	49
CS-600	Metal case for Superboard II, 610	-10
00 000	and 630 board and two power	
	supplies.	49
CS-610	Metal case for single floppy disk	-10
0.0	drive and power supply.	49
AC-12P	Wireless AC remote control system.	-20
	Includes control console, two lamp	
	modules and two appliance	
	modules for use with 630 board.	175
AC-17P	Home security system. Includes	1/3
HC-1/F	console, fire detector, window	
	protection devices and door unit for use with 630 board.	040
C4P Sams	C4P Manual.	249
		16
C3 Sams	Challenger III Manual.	40



#### To Order:

Or to get our free catalog CALL 1-800-321-5805 TOLL FREE. Charge your order to your VISA or MASTER CHARGE ACCOUNT Ohio Residents Call: (216) 464-8047. Or write, including your check or money order, to the address listed below



#### CLEVELAND CONSUMER COMPUTERS & COMPONENTS

P.O. Box 46627 Cleveland, Ohio 44146

Order Form: 8	LEVELAND CONSUMER OMPUTERS & COMPONI	P.O. Box 46627 ENTS Cleveland, Ohio 44146
☐ Superboard II \$279.	□ 630 Bc	oard \$229.
□ 610 Board \$298. □ Mini-Floppy Disk Dri	□ AC-3F ve \$299. □ C1P Sa	P 12" B-W Monitor \$159. ms Manual \$8.
(Attach separate sheet fo		
NAME:		<u> </u>
ADDRESS:		
CITY:	STATE:	ZIP:
Payment by: VISA: N	MASTER CHARGE:	MONEY ORDER:
Credit Card Account #		
Expires:	Interbank#(Master C	Charge)
TOTAL CHARGED OR I	ENCLOSED:\$	(Ohio Residents add 5.5% Sales Tax)

# Level II ROM Subroutine Test

#### Talk to your TRS-80 in its own language.

Function	Number Type	Decimal	Hexadecimal	
ABS	2-4-8	2423	0977	
ATN	4-8	5565	15BD	
BASIC	(Return L-II)	6681	1A19	
BASIC	(Return disk)	112	0075	
BREAK	(RST address)	16396	400C	
CDBL	2-4	2779	0ADB	
CINT	4-8	2687	0A7F	
CLS	2-4-8	457	01C9	
cos	4-8	5441	1541	
CSNG	2-8	2737	0AB1	
EXP	4-8	5177	1439	
FIX	2-4	2854	0B26	
INT	2	2871	0B37	
INVERT SIGN	2	3153	0C51	
INVERT SIGN	4-8	2434	0982	
LOG	4-8	2057	0809	
MEMORY	(Size input)	181	00B5	
RANDOM	2-4-8	467	01D3	
RETURN	(To subroutine)	32000	7D00	
RND < 1.0	4-8	5321	14C9	
SGN	2	2442	098A	
SIN	4-8	5447	1547	
SQR	4-8	5095	13E7	
TAN	4-8	5544	15A8	

Table 1. Level II arithmetic/trigonometric conversion table. Number types: 2 = integer; 4 = single precision; 8 = double precision.

Listing 1. Source code.				
00100 W4UCH	EQU	7D00H	;7D00H = 32000 DECIMAL	
00110	ORG	W4UCH	;PROGRAM WILL START HERE	
00120	LD	A,4EH	; 4EH="N"=NUMBER DESIRED ?	
00130	CALL	032AH	;DISPLAY "N" ON VIDEO	
00140	CALL	1BB3H	;KYBD/VIDEO INPUT ROUTINE	
00150	RST	10H	; SCAN STRING - SET C FLAC	
00160	CALL	0E6CH	;ASCII-ACCUM RET MINIMUM	
00170 RETURN	EX	AF, AF	; EXCHANGE REGISTERS-	

ere is another interesting test program for the advanced assembly-language programmer. It lets you access and test many of the arithmetic/trigonometric subroutines in the TRS-80 Level II ROM written by Microsoft's Bill Gates and Paul Allen.

The beginning assembly-language programmer should certainly learn how to write fundamental arithmetic/trig functions by himself, but once these techniques have been mastered as part of the learning process, it is inefficient and unnecessary to duplicate in assembly language those subroutines already in the Level II ROM.

Table 1 lists those functions and their addresses that may be accessed and tested by this mini-program that only occupies 144 bytes of high memory and may be entered using the TRS-80 Editor/Assembler in about five minutes.

Listing 1 is a printout of the test program's source code, and Listing 2 shows the program's object code. As you will see, the majority of this program is written using Level II ROM subroutines. Were these subroutines not used in this particular assembly-language test program, it would require ten times as much program memory and occupy 550 rather than 55 assembly-language program lines.

#### Program Flow

The comments included with the source code program are largely self-explanatory

and delineate each line's function. This program operates equally well with non-disk Level II, DOS 2.1, DOS 2.2 and NEWDOS +. Program operation is as follows:

- 1. Load the program under the SYSTEM or DOS command. Give it any name you wish. We like the program name DISCOV, for discovery, since that is what the program is all about. After loading is complete, type in /32000 to activate the program (with disk you must first load BASIC, then type SYSTEM, ENTER, and then type in /32000 ENTER, if you load the program in DOS).
- 2. The letter 'N?' will appear on the video. The program is asking you for a number to work on. Enter any number up to 16 digits, depending on the function you wish to test. Let us start out with a simple example by entering the number 100000.
- 3. The numbers '2' '100000' will appear on the next line of the video display. The '2' is the number type brilliantly calculated by the Level II ROM. Since we are dealing only with numbers in this article, we will skip over strings et al for the time being. The number types are as follows: 2 = integer, 4 = single precision and 8 = double precision. Table 1 lists those operations that can be performed on a number for a given number type; e.g., it is against the rules to take the square root SQR of an integer. We must first change it.
- 4. On the following line of the video display you will see 'C?'. The program is asking you what type of conversion you wish. Let's enter 2737, which is the address of the CSNG function, to change our number from an integer to single precision, then ENTER. The next line will show '4' '1000'. We now have a single-precision number to work with, so let's try taking its square root by typing in 5095, the address of the SQR routine, then ENTER. The next line shows '100'. This sure is easier than writing a complete stand-alone assembly-language square root subroutine. Let's try it again. Type in 5095 ENTER. Again, the line below displays the square root, this time, the numeral 10.
- 5. To insert a new number to try your program on, merely type in 32000 ENTER. This brings us back to where we started by displaying 'N?'. Thus, 32000 is our subroutine. Our assembly-language program does not discriminate between ROM or RAM; it could care less.
- 6. We could go on and on converting numbers such as deriving the natural LOG of any number and then restoring it to its original value via the EXP function, and/or deriving the TANgent of a number, then its arc tangent ATN and then the TANgent again . . . ad infinitum. You may escape this conversion routine any time you wish by typing 6681 ENTER, which will take you back to BASIC with a READY displayed. To return to your conversion routine, type SYS-

00180	EXX		:TO PRESERVE VALUES.
00190	LD	DE,411DH	MOVE MEM ACCUM DATA FROM
00200	LD	HL, STORE	; TO TEMPORARY STASH.
00210	LD	В,8	NUMBER OF BYTES TO MOVE
00220	CALL	09D7н	MOVE IT - SUBROUTINE
00230	LD	DE,4127H	MOVE CDBL DATA FROM-
00240	LD	HL, CDBL	TO TEMPORARY STASH.
00250	LD	В.8	NUMBER OF BYTES TO MOVE
00260	CALL	09D7H	:MOVE IT - SUBROUTINE
00270	LD	A, (40AFH)	NUMBER TYPE MEM LOCATION
00270	LD	(FLAG),A	MOVE TO TEMPORARY STASH
00290	ADD	A, 48	CONVERT TO ASCII NUMBER
00300	CALL	032AH	DISPLAY NUMBER TYPE
00310	LD	A,20H	:20H = ASCII SPACE
00310	CALL	032AH	DISPLAY SPACE ON VIDEO
00320	CALL	0FBDH	CONV MEM ACCUM TO ASCII\$
00340	CALL	28A7H	DISPLAY CONVERTED NUMBER
00350	LD	A,ODH	ODH=SKIP A LINE/CARR RTN
00360	CALL	032H	;DO IT - ON VIDEO DISPLAY
00370	LD	A, 43H	"C" = CONVERSION NUMBER?
00370	CALL	32AH	DISPLAY "C" ON VIDEO
00390	CALL	1BB3H	KYBD/VIDEO INPUT ROUTINE
00400	RST	10H	;SCAN STRING - SET C FLAG
00410		0E6CH	:ASCII-ACCUM RET MINIMUM
00410	CALL	OA7FH	CONVERT TO INTEGER
			STORE CONVERSION ADDRESS
00430 00440	LD	(CONV), HL	MOVE CDBL DATA FM STASH-
00450	LD	DE,CDBL	TO PERMANENT ADDRESS.
00460	LD	HL,4127H	; NUMBER OF BYTES TO MOVE
00470	CALL	B,8 09D7H	; MOVE IT - SUBROUTINE
00470	LD	DE, STORE	MOVE MEM ACCUM FM STASH-
00490	LD	HL,411DH	TO PERMANENT ADDRESS.
00500	LD	В, 8	NUMBER OF BYTES TO MOVE
00510	CALL	09D7H	; MOVE IT - SUBROUTINE
00510	LD	A, (FLAG)	: NUMBER TYPE FROM STASH-
00530	LD	(40AFH),A	TO PERMANENT ADDRESS.
00540	LD	HL, RETURN	RETURN MEM LOCATION-
00550	PUSH	HL HL	; LOADED INTO STACK.
00560	LD	HL, (CONV)	; CONVERSION MEM LOCATION-
00570	PUSH	HL HL	;LOAD ON TOP OF STACK.
00580	EX	AF, AF	RESTORE REGISTERS-
00590	EXX	Ar , Ar	TO ORIGINAL VALUES.
00600	RET		; SNEAKY CALL-TOP OF STACK
00610 FLAG	DEFS	1	; NUMBER TYPE STASH
00620 CONV	DEFS	2	CONVERSION ADDRESS STASH
00630 CDBL	DEFS	8	;CDBL DATA STASH
00640 STORE	DEFS	8	; ACCUMULATOR STASH
00650	END	W4UCH	; AMATEUR RADIO CALL LTRS
00000	מואם	MAUCH	ANDIO CALL LIKS

Listing	2.	Object	code
Listing	2.	Object	couc

7D00		00100	W4UCH	EQU	7D00H	
7D00		00110		ORG	W4UCH	
7D00	3E4E	00120		LD	A, 4EH	
7D02	CD2A03	00130		CALL	032AH	
7D05	CDB31B	00140		CALL	1BB3H	
7D08	D7	00150		RST	10H	
7D09	CD6C0E	00160		CALL	0E6CH	
7D0C	0.8	00170	RETURN	EX	AF, AF'	
7D0D	D9	00180		EXX		
7D0E	111D41	00190		LD	DE,411DH	
7D11	21837D	00200		LD	HL, STORE	
7D14	0608	00210		LD	B,8	
7D16	CDD709	00220		CALL	09D7H	
7D19	112741	00230		LD	DE,4127H	
7D1C	217B7D	00240		LD	HL, CDBL	
7D1F	0608	00250		LD	В,8	
7D21	CDD709	00260		CALL	09D7H	
7D24	3AAF40	00270		LD	A, (40AFH)	
7D27	32787D	00280		LD	(FLAG),A	
	C630	00290		ADD	A,48	
7D2C	CD2A03	00300		CALL	032AH	
7D2F		00310		LD	A,20H	
7D31	CD2A03	00320		CALL	032AH	
7D34	CDBD0F	00330		CALL	0FBDH	
7D37		00340		CALL	28A7H	
7D3A	3EOD	00350		LD	A, ODH	
7D3C		00360		CALL	032H	
7D3F		00370		LD	A,43H	
7D41	CD2A03	00380		CALL	32AH	
	CDB31B	00390		CALL	1BB3H	
7D47	D7	00400		RST	10H	
7D48	CD6C0E	00410		CALL	0E6CH	

7D4B	CD7F0A	00420		CALL	0A7FH	
7D4E	22797D	00430		LD	(CONV),HL	
7D51	117B7D	00440		LD	DE, CDBL	
7D54	212741	00450		LD	HL,4127H	
7D57	0608	00460		LD	В,8	
7D59	CDD709	00470		CALL	09D7H	
7D5C	11837D	00480		LD	DE STORE	
7D5F	211D41	00490		LD	HL,411DH	
7D62	0608	00500		LD	B,8	
7D64	CDD709	00510		CALL	09D7H	
7D67	3A787D	00520		LD	A, (FLAG)	
7D6A	32AF40	00530		LD	(40AFH),A	
7D6D	210C7D	00540		LD	HL, RETURN	
7D70	E5	00550		PUSH	HL	
7D71	2A797D	00560		LD	HL, (CONV)	
7D74	E5	00570		PUSH	HL	
7D75	08	00580		EX	AF, AF	
7D76	D9	00590		EXX	Comp.	
7D77	C9	00600		RET		
0001		00610	FLAG	DEFS	1	
0002		00620	CONV	DEFS	2	
8000		00630	CDBL	DEFS	8	
8000		00640	STORE	DEFS	8	
7D00		00650		END	W4UCH	
00000	TOTAL	ERRORS				

TEM, then ENTER and type /32000, then ENTER.

#### Conclusion

This article covers only a few of the subroutines in Level II BASIC ROM, Assemblylanguage programming is the ne plus ultra of serious computing. Your assembly-language program runs 300 times faster than the same program in BASIC and uses only 1/10th as much memory.

Learning to talk to your computer in its own language rather than through an interpreter (BASIC, FORTRAN or Pascal) is a most satisfying and rewarding experience if you have the patience and fortitude to master it.

The material in this article comes from The Disassembled Handbook for TRS-80, which is available from the author for \$10 postpaid.

#### **16K MEMORY** EXPANSION KIT FOR YOUR TRS-80. APPLE, AND S-100 COMPUTER

#### only \$59

- 200 Nsec Access, 375 Nsec Cycle
- Burned-in and Fully Tested
- 1 yr. Parts Replacement Guarantee
- Qty. Discounts Available



1230 W.COLLINS AVE. 159 ORANGE, CA 92668 (714) 633-7280

#### TIS-APL

- \* Stand alone APL for Z80 includes OS & DOS.
- User work space exceeds 27K with some systems over 32K bytes.
- \* Use of system commands, file and system functions.
- 3D arrays inner and outer products.
- Catenate, scan, compress, reduce and rotate along specified axis.
- Custom versions for many popular Z80 based computers.
- Systems functions for:

Communicating with other processors in-cluding large mainframe computers.

Full ASC II and APL interface with wide variety

Internal switching between APL and ASC II.

Calls to User written assembler routines.

TELECOMPUTE INTEGRATED SYSTEMS INC. 251 SPADINA AVENUE, TORONTO ONTARIO, CANADA M5T 2E2 PHONE: 416-363-9295

#### SS-50

- CALENDAR CLOCK
- INTERRUPT GENERATOR
- BATTERY BACK-UP
- PARALLEL I/O PORT
- SAMPLE FORMAT: SAT JUL 26 1980 10:30:24 PM

CLE 68-1 - The crystal controlled 30 pin I/O board provides a real time calendar/clock. The batteries are recharged when the computer is on & will keep the clock running 3 months or more without power. (No off-board components needed.) Time/date is read (12 or 2 hour format) and set using the software provided in the 36 page manual. Includes sample BASIC program to read time, patch for TSC assemblet to print time/date at tops of each page, and interrupt examples. Generates interrupts at intervals from 488 microsec. to 256 sec. Professional board is solder masked, silk screened, & fully socketed, NO jumpers (uses DIP switches). Includes fully buffered parallel 1/0 port for printer, keyboard, etc. Options include: Software on Smoke Signal Disk (5" or 8") \$14.95, Gold Bus connectors \$7.50, 2 MHz parts \$2.50, and Manual only (refundable with purchase of CLE). Available for THENDLATE NELLYMENT.
CLK 68-1 Manual only \$10.00 KIT \$89.95 A 6 T \$119.95 CLE 68-1 - The crystal controlled 30 pin I/O board provides a

AUTHORIZED SMOKE SIGNAL BROADCASTING DEALER ROBERTSON ELECTRONICS
1003 WARM SANDS DR. SE
ALBUQUERQUE, NM 87123 102 PH. (505) 294-0025

#### - Professional -**Real Estate Software** For Apple or TRS-80

#### **Property Management System** (32K, 1 Disk Systems)

- Tenant Information
  Late Rent Reports
  YTD & Monthly Income

- Partial Payments
- 5 Digit Expense Accounts
   Building Expense Report
   Vendor Expense Report Income Tax Report
- All Reports Can Be Printed
   Complete Documentation Easy Data Entry & Edit
   200 Units per File
- Price \$225.00

#### Real Estate Analysis Modules:

(Cassette or Disk)

- Home Purchase Analysis Tax Deferred Exchange
- Construction Cost/Pr
- Income Property Cashflow APR Loan Analysis Property Sales Analysis Loan Amortization

\$35 Per Module At Computer Stores Everyw Or Order COD Direct (Cal Residents Add 6% Sales Tax) oftware (213) 372-9419 MT I ompany \_\_\_\_\_ ealty

2045 Manhattan Ave., Hermosa Beach, CA 90254

#### INVESTMENT DATA SYSTEM for the APPLE II

At last! CREATE A COMPLETE DIGITAL DATA BASE in minutes for any stock or commodity. Months or even years of charted data can be traced from a graphics tablet using the INVEST-MENT DATA SYSTEM. After files are created to your specifications, they can be easily updated and displayed at any time.

The data bases may be created on a daily, weekly or monthly basis and analyzed in your own programs or other commercially available soft-

The INVESTMENT DATA SYSTEM is written for the APPLE II computer. At least one disk drive, Applesoft in ROM, a minimum of 32K RAM and a Talos' or Apple' graphics tablet are required.

Data System & Manual \$1202 \$ 202 Manual Alone No Charge Further Information

#### URBAN AGGREGATES INC. 6431 Brass Knob Columbia, Maryland 21044

1 Specify which

2 Maryland Residents, add 5% Sales Tax

#### C-10 SHORT 50 FT. **CASSETTES**



968-1604.

Otv. Price

10 \$0.75 50 \$0.65

Premium tape and cassettes acclaimed by thousands of repeat order microcomputer users. Price includes labels, cassette box and shipping in U.S.A. VISA and M/C orders accepted. California residents add sales tax. Phone (415)

V 123

MICROSETTE CO. 475 Ellis Street Mt. View, CA 94043



# FOR OHIO SCIENTIFIC COMPUTERS

# TRULY PROFESSIONAL WORD PROCESSING — EVEN ON VERY SMALL SYSTEMS!

At last, a word processing program that offers really impressive capabilities to small-system users.

The program's name is WP6502. Available on tape, 5" or 8" disk, WP6502 runs on **all** Ohio Scientific computers, with or without serial video terminal.

WP6502 is fast and responsive. It features instant line editing with two-way scrolling. It allows powerful global editing—search and replace at your discretion. You can do fancy page layouts, tab anywhere, change margins, and change line spacing, any place you wish. The command codes are so simple and logical you'll learn them within minutes.

WP6502 even includes advanced features such as Block Text (up to 99 blocks retrievable by number, in any sequence) and On-Line Entry (stop the printout whenever you like, to add personalized text from the computer keyboard).

#### DMS INTERFACE, TOO!

This truly professional program can be used with all your DMS files, new and old. All you need is our optional DMS interface.

#### AND A MODEST PRICE

The tape, 5" disk, or 8" 65-D version is only \$75. The 8" disk with both 65-D and 65-U versions is \$125. The DMS interface (for 65-U only) is \$50. Order by check or COD (New York residents add sales tax).

Or send for our free brochure listing additional options such as proportional spacing, justification, Network and Timeshare versions, and more!

# A BETTER WAY TO MANAGE DISK FILES

Now you can do what Ohio Scientific's disk-operating system never let you do before. Create a file on disk and save your data in that file in *one* instant operation! No need to clear the workspace. No need to switch disks.

DQ SECRETARY is the program which makes it possible.

Too much data for an existing file? DQ SECRETARY automatically extends the file for you. No room to extend it? DQ SECRETARY finds another space on the disk and puts the file there for you. Still no room? DQ SECRETARY even repacks the disk for you. Automatically! You never need to specify a track number.

DQ SECRETARY replaces Ohio

Scientific's CREATE, DELETE, RE-NAME, and DIR utilities and PUT and LOAD routines with one fast program that borrows only 2K of your workspace.

On 5" or 8" disk, DQ SECRETARY is \$50, by check or COD. New York residents add sales tax.

#### SINGLE-DRIVE DISK COPYING MADE EASY

Is it too much of a hassle to make backup copies of valuable disks, when you only have one disk drive?

Not any more. DQ DUPLICATOR lets you copy a disk in as few as *two* disk changes (depending on how much RAM your system has).

No need to call individual tracks and sectors. DQ DUPLICATOR works automatically and shows you a record of each track it reads and writes.

On 5" disk DQ DUPLICATOR is \$30, check or COD. New York residents add sales tax.

Our programs are not just ingenious. They're inscrutable.

Dwo Quong ∠87 Fok Lok Sow

23 East 20th Street New York, NY 10003



(212) 673 6310

# **Expansions and Programming**

Now that your computer is built, you'll want to expand it for more memory and I/O capability...and then on to programming.

Peter A. Stark PO Box 209 Mt. Kisco, NY 10549

've described how to build the basic Kilobaud Klassroom Komputer. This time I'll show some ways in which the computer can be expanded and begin my discussion of computer programming.

Though we did not originally intend our computer to be anything but a small control computer, a number of readers have asked for expansion information so they could make it into a more general-purpose system.

With some of the expansions described below, it is possible to run some programs that people associate only with larger systems. (For example, a machine-language monitor for entering, executing and debugging machine-language programs, as well as a Tiny BASIC, are available from Star-Kits, PO Box 209, Mt. Kisco NY 10549.)

#### Installing a Second PIA

The printed circuit board layout I presented last time has one socket that is fully wired for a PIA parallel interface chip, and a second socket that can be used either for a second 6820 (or 6821) PIA or for a 6850 ACIA for serial communications.

This socket is located in the top right corner of the PC board (see Photo 1). Since the PIA and ACIA connections are slightly different, only some of the pins of this socket position are already connected (the data bus and clock connections for the two ICs are in the same relative positions). The other connections, however (those that are different for the two ICs), must be wired by hand for the IC you plan to use.

Installing a PIA is easy. Just wire the following pins:

- Pin 24, CS1, connects to +5 volts. Pin 24 connects to a small round pad right next to it; just next to that is another round pad, which is at +5 volts. Connect a short jumper between them.
- Pin 34, RESET, connects to pin 34 of the other PIA. Small round pads are located next to pin 34 of both PIAs to make the connection easier.
- Pin 35, RS1, connects to pin 35 of the other PIA. Round pads located next to pin 35 of both PIAs are used.

In addition, both PIAs have small pads next to pins 2 through 19 and pins 39 and 40;

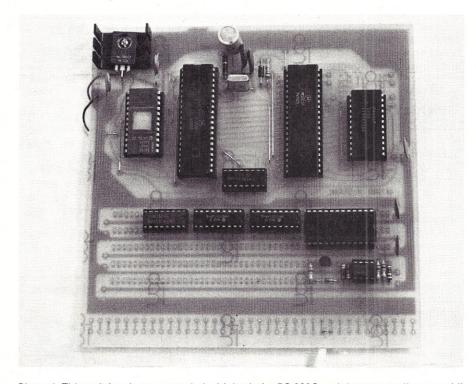
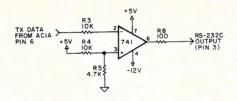


Photo 1. This unit has been expanded with both the RS-232C serial port as well as an additional 1K of RAM.



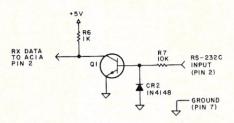


Fig. 1. RS-232C/TTL level conversion.

these pins are the data I/O ports that connect to the outside world. (I will give much more information regarding the PIA in a future installment.)

#### Installing an ACIA

Installing an ACIA takes a little more work, but is still useful. To take advantage of the nine pins prewired for either a PIA or an ACIA, the ACIA socket must be installed so pin 1 of the ACIA goes in the hole that would otherwise be used for pin 6 of the PIA. When installed in this way, the data bus and clock connections fit perfectly into the connections already established for the PIA.

The remaining ACIA pins must be connected by hand as follows:

Pin 1 to ground.

Pins 2 and 6 are the serial data input and output, respectively. Both of these are TTL-compatible, whereas most serial I/O devices will use either current loop or EIA RS-232C connections. This means that we must build an interface circuit that will convert between the TTL voltage levels used by the ACIA and either the voltage levels of an RS-232C connection or the current levels of a current loop connection. This interface circuitry, which I discussed in Kilobaud Klassroom No. 13 (October 1978, p. 46), can be built in the wire-wrap area of the board.

Fig. 1 shows the level conversion circuits needed to interface to an RS-232C terminal. The top circuit converts the TTL output of the ACIA to RS-232C levels of between -3 and -15 volts for a 1, and between +3 and +15 volts for a 0. It uses an inexpensive 741 op amp to provide the required inversion and to provide positive and negative output voltages. (Although a negative voltage supply is obviously needed to provide a negative output, the current is negligible and so a 9-volt transistor radio battery will provide enough current for even extensive testing and experimenting.)

The bottom circuit is used in the opposite

direction. Negative voltages from the RS-232C port turn off the transistor and provide a high level to the ACIA for a 1, while positive input voltages turn on the transistor and provide an output near 0 volts for a 0. Any inexpensive npn silicon transistor can be used in this circuit.

Pins 3 and 4 require a clock pulse at a frequency that is a multiple of the baud rate. The clock frequency can be either the same as the baud rate, 16 times the baud rate or 64 times the baud rate, depending on how the ACIA is programmed. But most designers, wishing to stay compatible with UARTs that require a frequency of 16 times the baud rate, use the same multiple with the ACIA. For example, for transmission at 300 baud, a frequency of 4800 pulses per second would be required.

Fig. 2 shows two common ways of generating this clock frequency. Fig. 2a uses a 555 timer IC as an oscillator to provide a frequency equal to 16 times the desired baud rate. Since the circuit frequency is set by an RC network, careful adjustment of potentiometer R2 is required, and even then the frequency may drift with time. But this circuit is still popular because it is inexpensive (though a frequency counter is needed for adjustment).

Several baud rate generator ICs that generate the same frequencies by using a crystal oscillator as a reference are available. One popular device is the Motorola MC14411. As shown in Fig. 2b, this circuit uses a 1.8432 MHz crystal, which connects directly to an on-chip oscillator to provide the crystal-controlled reference. Inside the 14411 is a series of counters that divides the crystal frequency to provide a number of simultaneous baud rate output signals. For example, the 300 baud rate output on pin 7 comes from a counter that divides the 1.8432 MHz crystal frequency by 384 to produce exactly 4800 pulses per second; this is equal to 16 times 300.

This circuit will provide almost any baud rate we might need (including some not shown in Fig. 2b), but it has the disadvantage of requiring a \$10 IC, as well as a \$5 crystal. If we don't need 110 baud, then the circuit of Fig. 3 saves the price of the crystal by using the computer's own clock as the crystal reference. (But this circuit will only work if the 6802 is using a 3.579 MHz color TV crystal for the clock.)

When a 3.579 MHz crystal is used as the 6802 clock, this frequency is divided by the 6802 to provide an Enable signal of 3.579/4 MHz, or .89475 MHz. This is just a little less than half of 1.8432 MHz (about three percent less, to be exact). If we send this signal to pin 21 of the 14411 instead of the 1.8432 MHz signal that would normally be there from the crystal, the 14411 will generate outputs just slightly less than half the nor-

mal ones. For example, pin 7 will provide an output of just under 150 baud, instead of the normal 300 baud. So if we need 300 baud, we simply move over to pin 5, which now provides just under 300 baud instead of its customary 600 baud. Although these baud rate signals are about three percent low, this is still within the normal tolerance of serial terminals.

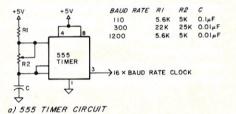
ACIA pins 8, 10 and 12 should be jumpered to +5 volts. The most convenient location is the hole that would otherwise go to pin 22 of a PIA.

Pin 9, CS2, should be connected to pin 11 of the 74LS138 address decoder at the small round pad next to it.

ACIA pin 11, RS, connects to address bit A0 at the hole that would normally connect to pin 36 of a PIA in that IC position.

Pin 13, R/W, should be connected to the hole that would otherwise go to pin 21 of a PIA.

Finally, pins 23 and 24 should be grounded to pin 1 of the PIA socket. (If, however, a serial port with handshaking is needed,



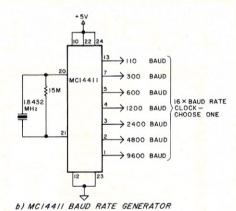


Fig. 2. Two circuits for generating a 16x baud rate clock for an ACIA.

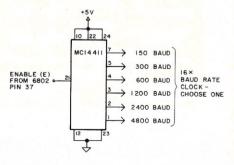


Fig. 3. Alternate 16x baud rate clock generator.

-12V	741-4
5V	*PIA2-22 ACIA-10 ACIA-12 ACIA-8 MC14411-10 MC14411-22 MC14411-24 R4-1 R6-1
741+	741-3 R4-2 R5-1
741-	741-2 R3-2
7410UT	741-6 R8-1
87	741-7
AO	*PIA2-36 ACIA-11
ACIASEL'	*74LS138-11 ACIA-9
BAUDCLOCK	ACIA-3 ACIA-4 MC14411-3
EIA-IN	EIA-PIN-2 R7-2
EIA-OUT	EIA-PIN-3 R8-2
ENABLE	*PIA2-25 MC14411-21
GROUND	*PIA2-1 ACIA-1 ACIA-23 ACIA-24 CR2-2 EIA-PIN-
	MC14411-12 MC14411-23 Q1-E R5-2
Q1BASE	CR2-1 Q1-B R7-1
R/W'	*PIA2-21 ACIA-13
RXDATA	ACIA-2 Q1-C R6-2
TXDATA	ACIA-6 R3-1

Table 1. Wiring list for adding an ACIA, baud rate generator and serial RS-232C port.

then pin 24, CTS, is used for that purpose. When pin 24 is low, the ACIA will output; when it is high, the ACIA will stop outputting and will wait.)

Table 1 is a wiring list that shows all the connections needed to install a complete serial port using the circuitry of Figs. 1 and 3. The connection points marked with a star are existing points in the computer to which you can connect to get the desired signal. For example, address bit A0 is listed as A0 \*PIA2-36 ACIA-11

which means that A0 is present on pin 36 of the PIA2 socket and should be connected to pin 11 of the ACIA.

Photo 1 shows how this addition mounts on the printed circuit board. The 6850 ACIA is in the top right corner, with the 14411 right under it. The eight-pin IC under that is the 741 op amp, and the rest of the RS-232C interface is just to its left. In this case, the 25-pin RS-232C connector is on the other end of a six-foot cable, but it could have been attached to the edge of the board with a hot-melt glue gun.

#### Adding 128 Bytes More RAM

The basic 128 bytes of RAM inside the

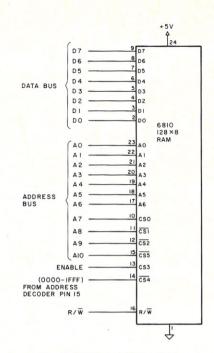


Fig. 4. 128-byte RAM addition.

6802 is enough for many applications, but sometimes additional RAM is useful. There are two easy ways to add a little more RAM. The easiest-requiring just one IC-adds another 128 bytes of RAM using an MCM6810 RAM for about \$5 (Fig. 4). The wiring list for adding this modification is

APPLE COMPUTER	
Apple II Plus 16K	995.00
Apple II plus 32K	
Installed	1065.00
Apple II Plus 48K	
Installed	1135.00
Apple II Disk with Controller 595.00	519.00
Apple II Disk w/o Controller 495.00	469.00
Apple Pascal Language	
System	399.00
Apple Silentype Printer 595.00	529.00
Silentype Paper (Box of 10) 42.50	39.95
nteger Firmware Card 200.00	179.00
Centronics Parallel Printer	
Card	189.00
High Speed Serial Card 195.00	169.00
Proto / Hobby Card 24.95	19.95
Dos 3.3	55.00
Apple Plot	59.00
Dos Tool Kit	65.00
Apple Fortran	
(Requires Pascal) 200.00	179.00
Apple Post	45.00
Apple Writer	65.00
The Cashier	219.00
MICROSOFT	
Z-80 Softcard	329.00
D.C. HAYES	
Micromodem II	349.00
CORVUS	
11-AP 12 Megabyte	-
Hard Disk	4695.00
FILITSII	
FUJITSU 16K Ram Set (4116's) 200ns 160.00	49.95
16K Ram Set (4116's) 200ns 160.00	49.95
16K Ram Set (4116's) 200ns	
16K Ram Set (4116's) 200ns	119.00
16K Ram Set (4116's) 200ns	

CALIFORNIA COMPUTER SYSTEMS	
7114 12K Rom/Prom Card	68.00
7424 Clock/Calendar Card 125.00	109.00
7440 Programmable Timer Card	00.00
7470 BCD Analog to	98.00
Digital Card	98.00
7490 GPIB IEEE-488	90.00
Interface Card	259.00
7520 Extender Board	22.00
7710 Asynchronous Serial	22.00
Card 159.95	139.00
Card	100.00
Card	139.00
7720 Parallel Printer	.00.00
Interface119.95	99.00
7728 Centronics Parallel	
Printer Card	99.00
7811 Arithmetic Processor	
Card	349.00
MOUNTAIN HARDWARE	
Apple Clock/	
Calendar Card 280.00	259.00
Supertalker	269.00
ROM Plus	145.00
ROM Writer	159.00
Keyboard Filter ROM	49.00
Copy ROM	49.00
Introl X-10 Home	
Control System	269.00
Firmware Development	
System	299.00
Music System	499.00
MICROSOURCE	
Ledger Plus (A/R; A/P, Gen. Ledger)	599.00
	388.00
M & R ASSOCIATES	
Supermod II Video	
Modulator	29.00
Sup-r-board 80	
Column Board	349.00

ANADEX		
DP-8000-AP 96 Column		
Printer	845.00	
Printer	1405.00	
	1485.00	
CENTRONICS		
730-1 Printer	695.00	
737-1 Printer	849.00	
779-2 Printer1400.00	949.00	
QUEME		
Sprint 5/54 RO Letter		
Quality Printer	2695.00	
Sprint 5/45 RO Letter		
Quality Printer	2795.00	
Forms Tractor	199.00	
SANYO		
9 inch B & W Monitor	169.00	
12 inch B & W Monitor	289.00	
	289.00	
LEEDEX		
100-80 12 inch B & W		
Monitor199.00	169.00	
SOFTWARE TECHNOLOGY		
Payroll Package		
(Specify State)	240.00	
Apartment Manager	325.00	
Professional Time and	020.00	
Billing	325.00	
Inventory Program 199.00	140.00	
Data Base Management 149.00	99.00	
Mailing List System	39.00	
•	00.00	
COMPUTER SYSTEMS SOFTWARE		
Accounts Receivable	149.00	
Package		
Sup-r-sort	29.95	
Serial Print Routine39.95	29.95	
Baudout Print Routine 39.95	29.95	
ARTSCI INC		
Magic Window Word		
Processing System	79.95	

TERMS
Freight prepaid on all Apple products. Visa and M/C accepted. We are an authorized Apple Level I warranty station and will gladly service in warranty and out of warranty products. Foreign orders welcome, please specify shipment procedures and add freight. OLENSKY BROS. INC. **COMPUTER SALES DIVISION** 3765 AIRPORT BLVD. MOBILE, AL. 36608 (205) 344-7448



CALL COLLECT WHEN **ORDERING!** 



shown as Table 2.

No additional circuitry is needed since this IC has six chip select (CS) inputs. To enable the 6810, CS0 and CS3 must be high, while CS1, CS2, CS4 and CS5 must be low. In this circuit, these chip selects work like this:

CS4 connects to pin 15 of the 74LS138 address decoder (shown in Fig. 9 of the June installment). This pin goes low only on valid memory addresses beginning with 000 in bits A15, A14 and A13; this translates to the entire range from 0000 to 1FFF (in hexadecimal).

CS0, CS1, CS2 and CS5 connect to address bits A7 through A10; together with CS4, then, any memory address such as

000x x000 1xxx xxxx

(where x stands for a don't-care bit, which could be either 0 or 1) will select this RAM IC. If A12 and A11, the two don't-care bits on the left, are 00, the 6810 takes on addresses from 0080 through 00FF, which is the 128 bytes just above the 128 bytes already in the 6802, giving us a total of 256 bytes from 0000 through 00FF. This is a useful address range, since this first group of 256 locations (called page 0) is especially easy and quick to address in a 6800 or 6802 processor.

(Because of incomplete address decoding, if those two don't-care bits are nonzero,

this RAM also responds to addresses 0880, 1080 and 1880, but this doesn't conflict with any other address assignments.)

Finally, CS3 connects to the Enable signal coming from the 6802. This is a timing signal that makes sure that the 6810 is selected only when valid data actually exists on the data bus. As shown in the waveforms in the June installment, data is present on the data bus at the end of the E signal and should normally be grabbed off the bus at that time.

When data is coming from the outside back to the 6802, the processor does this automatically; but whenever data is being sent from the 6802 out to some other device such as a memory IC or I/O device, then this device must be told when to get the data. This is why it wasn't necessary to send the E signal to the 2716 EPROM (which never gets any data from the data bus), but has to be sent to the PIA, ACIA and all RAM.

#### Adding 1K More RAM

A slightly more ambitious project is to add an entire 1K of RAM with just three chips, using the circuit of Fig. 5 for a total cost of about \$15. These three ICs are shown in Photo 1, just to the left of the 14411 baud rate generator.

The 74LS138, labeled SEL2 in Fig. 5, is an additional address decoder (not the same

5V	6810-24	
AO	*6802-9	6810-23
A1	*6802-10	6810-22
A2	*6802-11	6810-21
A3	*6802-12	6810-20
A4	*6802-13	6810-19
A5	*6802-14	6810-18
A6	*6802-15	6810-17
A7	*6802-16	6810-10
A8	*6802-17	6810-11
A9	*6802-18	6810-12
A10	*6802-19	6810-15
ADDROGOO'	*74LS138-15	6810-14
DO	*6802-33	6810-2
D1	*6802-32	6810-3
D2	*6802-31	6810-4
D3	*6802-30	6810-5
D4	*6802-29	6810-6
D5 .	*6802-28	6810-7
D6	*6802-27	6810-8
D7	*6802-26	6810-9
ENABLE	*6802-37	6810-13
GROUND	6810-1	
R/W'	*6802-34	6810-16

Table 2. Wiring list for adding an MCM 6810 RAM.

as the 74LS138 already on the board). Its primary function is to gate the Enable clock with the address 2000-3FFF signal from the main 74LS138 decoder, so that the two 2114 RAMs get a low CS signal only when the E signal is high and the 2000-3FFF select signal is low. This is absolutely necessary to make sure that the RAM grabs data off the data bus at the right time when storing. Although this could just as easily



- · Compiler executes under the CP/M operating system in as little as 32 K bytes of RAM
- Interactive Symbolic Debugger which enables the programmer to examine variables, set a breakpoint, and trace procedure calls interactively at run time
- Compiles at the rate of 600 lines per minute on a 2 MHZ 8080
  Programs Execute up to 10 TIMES
- FASTER than popular interpretive **Pascals**
- The code generated is 8080 object code which is ROMable with a minimum run time overhead of 1.5K bytes · Interrupt procedures allow the pro-
- grammer to write interrupt drivers for I/O and other real time tasks in Pascal/MT

  Bit manipulations of variables may be performed with the built-in procedures: SETBIT, CLRBIT, TSTBIT, SHL, SHR, SWAP, LO, HI.

  Assembly language subroutines may be called from Pascal/MT

  Business arithmetic version of Pascal/
- Business arithmetic version of Pascal MT is also available
- Pascal data structures supported are: ENUMERATION AND SUBRANGE TYPES, RECORD, ARRAY, REAL, INTEGER, CHAR, and BOOLEAN
  Not implemented are: SETS, GOTO, GET, PUT

# THE ORIGINATOR OF THE TRS-80®



- · Enhanced Upward Compatible File System
- Powerful New Random Access Capabilities

FMG Corporation now offers the CP M 2.2 for the TRS-80 Model II. From minidisks, floppy disks, all the way to high-capacity hard disks, the flexibility of CP/M 2.2 makes it a truly universal operating system. The package includes an 8" system disk editor asseman 8" system disk, editor, assembler and debugger for the TRS-80 Model II.

AS LOW AS \$200.00

- · General Ledger
- Payroll
- · Accounts Payable
- Accounts Receivable

These business systems are designed with the business manager in mind! Totally screen oriented, they give complete user prompting as each entry is required. Major changes in your current book-keeping method are not necessary to make these programs work for you.

AS LOW AS \$250.00

CP/M is a registered trademark of Digital Research Corp. TRS-80 is a registered trademark of Radio Shack

M-451

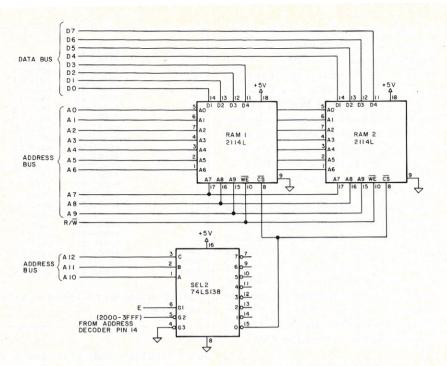


Fig. 5. 1K RAM addition to the basic computer.

be done with a 74LS00 gate at slightly less cost, the 74LS138 does a better job since it also decodes the addresses better-it reguires that address bits A12 through A10 also be 0, so that the 2114 RAM only responds to the 1K address range from 2000 to 3FFF.

Though we can really make do without this, it simplifies things if we ever decide to add another pair of 2114s, since the eight outputs of SEL2 divide up the 8K address range from 2000 through 3FFF into eight 1K ranges.

We could add another 1K of memory by wiring up still another pair of 2114s in the same way, except that the CS pin on this pair would go to pin 14 of SEL2. If it weren't for loading the 6802 address and data buses (and lack of room on the board), we could thus add a total of 8K memory. In practice, though, we would find that having much more than 1K of memory would overload the buses and start causing other problems unless we buffered them. Since this would turn the computer into something other than what we started with, let's not consider that further.

Table 3 is a wiring list that shows all the wiring needed to add this 1K memory expansion to the computer. As before, connection points marked with a star are points in the computer where the required signal can be obtained.

#### A Few Extra Bits

If you really don't need a full PIA or ACIA (or have already added one and find you still need an extra bit or two of input or output), then all you need is a flip-flop or three-state buffer. The idea is to use readily available,

inexpensive ICs (Radio Shack has them), but take advantage of all the extra unused 74LS138 outputs.

Fig. 6 shows how the 74LS367 hex threestate buffer can be added to provide six input bits. The six inputs come in from the left, while the six outputs on the right go to six bits of the data bus.

The 74LS367 has six three-state buffers divided into two groups-the top two are turned on when the signal called Select 2 goes low, while the bottom four go on when Select 1 goes low.

If we tie these select signals to the unused outputs of the 74LS138 address decoders, we can select either group of buffers whenever the specified address is used in a program. (Normally, the two select signals would be connected together to the same 74LS138 output, but they could go to two different pins.)

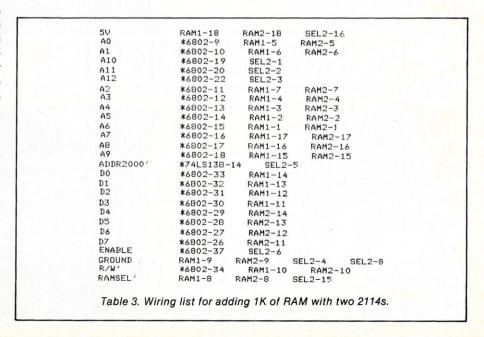
For instance, suppose that both select pins are connected to pin 12 of the main 74LS138 address decoder (shown in Fig. 9 of the June installment). This pin goes low whenever any address in the range of 6000-7FFF is encountered in a program.

Whenever the computer program does any read from any of these addresses, this signal turns on the 74LS367 input buffers, and the 6802 does a read from these six input lines. Hence, this makes a simple six-bit input port.

Since the R/W signal isn't used anywhere in this circuit, this input port will be selected regardless of whether we read from, or write out to, one of the addresses in the 6000-7FFF range. If we are writing to such an address, then the 6802 will be putting data on the data bus at the same time as the 74LS367 does so, and this will result in garbage on the bus (as well as undesirable loading on the bus as two drives try to force it in different directions). Thus, if we use a simple port such as this one, we must make sure that our program only reads from it, never writes to it.

Fig. 7a shows the correct way to wire a one-bit output port. One of the data bits from the data bus goes to the data input of a type D flip-flop such as a 74LS74, and a select signal from an address decoder (the 74LS138) goes to the clock. At the end of the select pulse - the rising edge shown in the diagram-the data from the data bit is clocked into the flip-flop.

Though this is the theoretically correct way to wire an output bit, it has two problems. First, the D input of the flip-flop adds an extra load to the data bus, which may



#### THE NEXT GENERATION OF MICROCOMPUTERS IS HERE

AT QUASAR DATA PRODUCTS



**16 BIT POWER** 

AND STILL RUN YOUR 8 BIT SOFTWARE

#### IF YOU see it our way then we think we have the products for you:

- The S-100 bus is here to stay. It is not the greatest but with proper termination it works reliably at high speeds, and since it is now an IEEE standard, it is well defined.
- The 8 BIT systems are useful but they are the limiting factor for many applications.
- The 16 BIT systems are the way future systems will go. Why not? There is very little price difference and an order of magnitude performance difference.
- The real usefulness of the 16 BIT microprocessors will be determined by the software.
- The systems using 5½ inch disk drives really do not have adequate memory storage or computer power for many business or scientific
- · Sixty-four kilobytes of addressable RAM, the maximum for 8 BIT systems, is not adequate for many business or scientific applications.
- It is not worth buying 8 BIT systems or boards now if you can get the same software with 16 BIT systems at about the same price.

**8 BIT POWER** 7.-80



• The new 16 BIT microprocessors have power comparable to minicomputers but do not require the same overhead in terms of downtime, maintenance, or initial investment. They are more versatile in many applications such as real time applications.

#### THIS IS WHAT ODP HAS AVAILABLE:

- A Z-8000 Board that can plug into your existing S-100 Bus System (see below for description)

  • A complete Z-8000 System (see below for description).
- A Z-8000 System configured for your exact needs
- Software to allow you to run all the available Z-80/8080 software including CP/M.
- Software that includes a Monitor, Debugger, Disassembler, and Basic.
   Software options: a) Extended Monitor, b) Pascal, c) Simulators for 8080, Z-80, 6800, 6502, 1802.
- A Z-80 System (QDP-100) that is upward compatible with the Z-8000.

#### THIS IS WHAT IS COMING FROM QDP:

- A 256 kilobyte RAM card
- UNIX2 operating system.

#### Z-8000 SERIES 16 BIT CPU S-100 BOARD - CAN BE PLUGGED INTO YOUR EXISTING SYSTEM \$695.00

- Fully S-100 IEEE compatible.
- Supports existing 8 BIT memory and 8 BIT peripheral boards.
- Capable of reading and/or writing 8 BIT, 16 BIT, or mixes 8 BIT and 16 Bit memories automatically.
  8 BIT and/or 16 BIT peripheral modules can simultaneously
- co-exist in the same bus without any modifications. Capable of operating as a slave processor to enable your existing CPU to control the Z-8000.

#### **Industrial** Quality

- Supports either segmented CPU or non-segmented CPU.
- Power-on and reset jump dip switch selectable.
- Jumper selectable 2 or 4 MHz. operation.
- Dip switch selectable number and type of wait states.

#### SOFTWARE

- Z-80 emulator enables you to execute your existing 8 BIT software without any modifications and allows you to run CP/M immediately.
- Extended Monitor, Debugger, Disassembler

#### **QDP-8100 WITH 2 MEGABYTES STORAGE** STANDARD (OPTIONAL 4 MEGABYTES)

Z-8000 series 16 BIT CPU S-100 Board - see above

#### SOFTWARE (Provided with system)

- CP/M 2.2¹ operating system
- Basic
- Z-80/8080 Emulator
- Monitor, Debugger, Disassembler software
- Optional software: Pascal
- UNIX<sup>2</sup> operating system coming

#### **SYSTEMS**



#### **QDP-100 WITH 2 MEGABYTES STORAGE** STANDARD (OPTIONAL 4 MEGABYTES)

• Z-80 series 8 BIT CPU S-100 Board (4 MHz. Z-80, Double density disk Controller, 2716 Prom Burner 2 Parallel & 2 Serial Ports, real time clock) \$4.995.

#### SOFTWARE (Provided with system)

- CP/M 2.2¹ operating system
- · Basic
- Accounts Receivable, General Ledger, Accounts Payable, Payroll with Cost Accounting

  Optional software: Fortran, Pascal, Cobol, C

#### **EACH SYSTEM CONTAINS:**

• Intelligent CRT terminal (80 characters X 24 lines) • 64 kilobytes RAM • Two 8 inch, double sided, double density floppy disk drives with controller • 2 serial and 1 parallel (2 parallel for QDP-100) ports • Attractive woodgrain cabinet with power supplies and cabling

FULL TECHNICAL SUPPORT FROM THE STAFF AT QUASAR DATA PRODUCTS

#### 4 Mhz 64K Dynamic RAM

16K - \$250°° 32K - \$35000 48K - \$45000

64K - \$54900

\$6.395.

#### TELETEK DBL. DENSITY, DBL. SIDED

#### **QUASAR FLOPPY SYSTEM**

• Two MFE DBL sided drives • Cable • Case & Power Supply assembled and tested Wood cabinet ...... 1895\*\*



#### **QUASAR 2 MEG FLOPPY**

- · 2 MFE double sided drives
- Teletek disk controller board
- · Power supply & cable
- Wood cabinet
- CP/M version 2.2 & bios
- Assembled & tested . . . . . . . 2295<sup>oo</sup>

Dealer Inquiries Invited, Hours:9-5:30 M-F

Specifications Subject To Change ¹CP/M™ Digital Research <sup>2</sup>UNIX™ Bell Lab 3Z-8000™ Zilog

#### PAPER TIGER

Includes Graphics . . . . . . . 94900 Cable for TRS-80 ..... \$3900

MFE Double Sided - Double Density 8" Floppy Disk Drives. (the best) . . . . 65000 Using the Teletek Controller under CP/M, THIS DRIVE WILL GIVE YOU ALMOST ONE MEGABYTE PER DISK DRIVE. 

TI - 820

Serial Printer -

Full package options . . . \$199500

Call for Apple 30 Day ARO



Checks, money orders accepted

Add \$2.50 freight charges on orders under 10 lbs. Over 10 lbs. F.O.B. Cleveland

QUASAR DATA PRODUCTS ~295

25151 Mitchell Dr., No.Olmsted, Ohio 44070 (216)779-9387



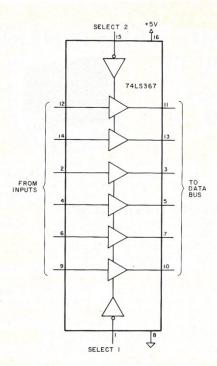


Fig. 6. Simple input port using a 74LS367.

cause problems if the data bus is already heavily loaded.

Second, since the data bit should be entered into the flip-flop at the end of the Enable signal, this signal should in some way be part of the select signal going to the clock input. Thus, the outputs of the SEL2 decoder 74LS138 IC shown in Fig. 5 would be suitable, but the outputs of the main 74LS138 would not.

If we don't use the data bus, then the timing is not as critical. Fig. 7b shows an alternative idea. Here, the select signal from the 74LS138 goes to the clock input of a JK flipflop such as the 74LS73, while the J and K inputs both go straight to +5 volts. With this connection, the flip-flop will toggle every time it gets a clock pulse. Hence, we can flip the flip-flop simply by selecting the correct address (so the 74LS138 outputs a pulse).

The trouble with this circuit is that we can never be quite sure whether the flip-flop is on or off at any particular time, since the computer has no way of knowing whether it started out set or reset when the power first came on. In some cases this doesn't matter - in generating music, for instance.

But if it does, then we could disconnect the CLR pin from +5 volts (which was disabling it) and connect it instead to the reset pin of the 6802. Since this pin is always low when the system is first turned on, this will guarantee that the flip-flop will always be reset when we first power up the system.

Fig. 7c is another possibility. Here we disable the D input and clock (or the JK and clock inputs of a JK flip-flop) by connecting them to +5 volts. Instead, we take two different select outputs from the 74LS138 and connect one to the PS (preset) input, and the other to the CLR (clear) input of the flipflop. Now we can set or reset the flip-flop explicitly.

For example, suppose the PS input goes to the 6000-7FFF output of the address decoder (pin 12), while the CLR input goes to the 4000-5FFF output (pin 13). Any time we access any address in the 6000 range, the flip-flop gets a low PS pulse and sets; if you access any address in the 4000 range, it will

Since we only have a few unused outputs on the 74LS138, we obviously cannot connect too many such flip-flops, but with four decoder outputs we could trigger three flipflops simply by connecting all three resets to the same output and connecting the three sets to three outputs. Now we don't have completely independent control over the flip-flops, since they will all reset together. But this may still be quite useful.

#### From Hardware to Software

Having seen how to build, test and even expand our control computer, it's time to examine how to program it. Although the computer can run programs written in Tiny BASIC when properly expanded, let's keep in mind its primary purpose - to be a dedicated control computer. That requires that we program it in machine or assembly language.

So let's discuss machine- and assemblylanguage programming. Rather than start at the very beginning, we will assume that all our readers have some familiarity with programming in BASIC.

Since 6802 machine language is identical with that of the 6800, this discussion applies to both processors.

#### 6802 Internal Structure

When programming in BASIC, we tend to think in terms of the job to be done, rather than the way in which it is being done. Machine- and assembly-language programming is different-you must constantly think of the hardware that is doing the program. Thus, you can write a BASIC program without even knowing what computer it will be used on; but to write programs in machine or assembly language, you must know what is inside the computer and - to some extent-how it works. This makes programming tougher, but also more fun and more challenging.

Fig. 8 shows a simplified view of what is inside the 6802 (or 6800) processor. (A few extra registers, as well as the 128-byte RAM, are not shown, simply because they do not concern us at this point.)

Within the 6802, the hardware consists primarily of a set of various registers, plus an eight-bit transfer bus that interconnects them and allows data or addresses to go back and forth within the processor. A register is essentially a group of storage elements - flip-flops or dynamic memory cells - that holds a binary number. While a program is running, numbers are constantly being moved back and forth between these registers.

Some of these transfers are managed by the 6802's internal control circuitry and are completely out of our control; other transfers are directly controlled by the program instructions we write.

Some of the registers hold eight bits, some 16 bits. One (the condition code register at the top) only holds six. In any case, all of these are interconnected by an eight-bit transfer bus, so that each half of a 16-bit register is connected to the bus separately. When a 16-bit number is transferred from one place to another, it is moved in two eight-bit pieces. This will help to explain why some instructions are faster than oth-

Two of these registers are called accumulators; they are the A accumulator and the B accumulator. An accumulator is a type of register that can not only hold a number, but can also do some additional operations on it, such as addition or subtraction. Both 6802 accumulators hold eight-bit numbers. Virtually all arithmetic operations in a 6802 system are done in one of the accumulators.

Accumulators are generally the workhorses of a computer. There are instructions for loading a number from memory into an accumulator, for adding or subtracting numbers in an accumulator, or for storing a number from an accumulator back into memory. In addition, numbers in an accu-

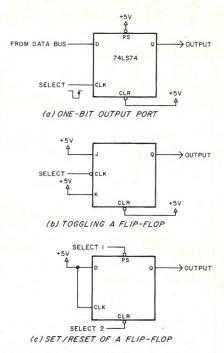


Fig. 7. Three simple output ports.

mulator can be tested in various ways, moved from one accumulator to another or shifted left or right.

The six-bit register is the condition-code register. Though it is called a register for convenience, it really is composed of several different parts, each of which holds just one bit. These bits are used to indicate whether the result of a previous operation had some specific trait, such as being zero, nonzero or negative. One of these bits is also used to control the interrupt system. (Although this register only has six bits, when we transfer its contents into an eightbit register or into memory, we pick up an extra two bits along the way. These sometimes fool us into thinking this register really has eight bits when it does not.)

Another useful register is the index register. Though the index register can be used for a variety of purposes, its most common use is to hold and manipulate addresses; thus it is a 16-bit register so that it can hold a full 16-bit address.

The index register can be loaded from memory; its contents can be incremented or decremented (increased or decreased by 1) or stored back into memory. In addition, the contents of the index register can be used as a pointer to point to a specific location in memory which will be accessed at some point.

Another 16-bit register is called the stack pointer. This register points to the next empty location in the stack; the stack, in turn, is a memory area set aside for temporary storage of data and addresses. A common use for the stack is to hold the return address from a subroutine - in terms of BA-SIC, this means that when a go-to-subroutine instruction (such as GOSUB) is executed, the computer places into the stack the address of the instruction it should return to when the subroutine is finished. The stack pointer register is simply a pointer used to indicate which part of the stack has been filled up and which part is still empty. As numbers and addresses are put into or taken from the stack, the pointer keeps changing, so that it always points to the next empty location in the stack.

The last 16-bit register of concern to us is the program counter. Actually, the programmer doesn't have much control over the program counter, since there are no instructions that specifically let you manipulate that register. But the program counter is important since it keeps tab on the next instruction to be performed in our program. It is affected by transfer instructions (which are similar to BASIC's GOTO, GOSUB or RETURN).

Though a few more registers are inside the 6800 or 6802, these are used internally and are not normally used by the programmer.

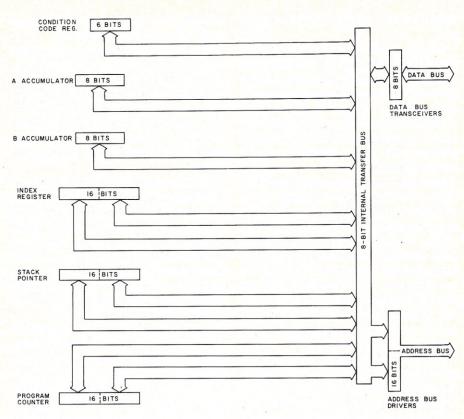


Fig. 8. The inside of the 6802.

If you are familiar with other processors, you may note that the 6802 registers are different from those you are familiar with. The register structure of a processor—and the instructions it has to use them—distinguishes one microprocessor from another. Some processors, such as the 8080 or Z-80, have many different registers; others, such as the TMS-9000 or the SC/MP, have few.

Actually, the number of registers does not really determine whether a processor is powerful or not, since those processors that have few registers tend to have instructions that allow them to do operations that are optimized to work without them.

Though various articles have compared different microprocessor structures (see, for example, the excellent articles by Hal T. Gordon entitled "Instruction Sets Examined and Compared" in the March and April 1980 issues of *Microcomputing*), different programmers will prefer different processors. Many programmers like the 6800 and 6802 because it is simple yet powerful; the fact that its architecture is more traditional rather than unusual (such as the TI TMS or the Signetics 2650) may also have a lot to do with that.

#### **Computer Languages**

Computer programs must be written in a special way so that the computer will be able to understand them. This generally requires that we use a certain vocabulary and a set of grammar rules, much like a human language. Thus we get the term "computer"

language" to describe the way a program is written.

There are essentially three types of computer languages:

•Machine language is the only language that the computer can really understand. Since the computer works with binary digits—ones and zeros—the machine-language program is written in these as well. When a machine-language program is entered into the computer, it can be immediately performed.

Note that machine language is directly tied into the hardware of the processor. Thus, different processors will have different machine languages, and a program written for one will not run on another (unless you intentionally copy the language of the other).

•Assembly language is one step above machine language. In many ways, it is similar to machine language in that generally one instruction in the assembly-language program is equivalent to one instruction in the machine-language program. The difference is that that instruction consists of numbers in machine language, whereas it may consist of simple letter codes in assembly language.

Since assembly language cannot be directly understood by the computer, it must first be translated into machine language. But since the two languages are so similar, that translation is fairly simple. For short programs you can do it yourself; for longer programs this translation is done by still an-

other computer program called an assembler

Since assembly language is so close to machine language that it is translated on a more-or-less one-to-one basis (one assembly-language instruction becomes one machine-language instruction), different machine languages must result in different assembly languages. An assembly-language program written for one processor will also not run on another.

•Higher-level languages, also sometimes called problem-oriented languages, are at the top of the list. These languages are completely different from machine or assembly language and generally require quite extensive translation into machine language before they can be executed on the computer. This translation could be done manually, but even for short programs this is not practical; hence, translation is usually done by a translator program called a compiler or an interpreter.

Higher-level languages are aimed at a particular application, rather than a particular computer. Since extensive translation is required anyway, there is no need to tailor the language to fit a machine. A language such as BASIC is similar whether it runs on an IBM 370 or a TRS-80. Obviously, though, the translator for the two computers will be

different, and the resulting machine language will also be much different.

The higher-level languages are oriented toward specific kinds of problems. Languages such as BASIC, FORTRAN, ALGOL or MAD are at their best with numeric problems from math or engineering; COBOL or RPG might best be suited for business applications; while languages such as LISP, SNOBOL or LOLITA might be good for strings.

(There have been hundreds of higher-level languages in the few short decades of computers, including some with interesting names such as JOVIAL, MADCAP, ADAM and BASEBALL. If you are interested in a readable history of the subject, I strongly recommend *Programming Languages: History and Fundamentals* by Jean E. Sammet, published by Prentice-Hall, Inc., in 1969 and readily available in larger libraries.)

There are many exceptions. Some smart assemblers allow a single assembly-language instruction to translate into many machine-language steps. And in some computers, the translator for a higher-level language is built-in so that it almost looks as though this higher-level language is the only language the machine can understand. (That is certainly how a TRS-80 must appear to the beginner!)

In a higher-level language, we are concerned with the job to be done, and not with the mechanics of how it is to be achieved. For example, to add two numbers in BASIC, we simply say

C = A + B

In machine or assembly language, we must be concerned with small details, such as where in memory A, B and C are to be found and what part of the processor will be used to perform the addition.

Remembering that memory locations are referred to by their addresses, we might have A in location 100, B in location 101 and C in location 102. Then the C = A + B program would have to be broken down into smaller steps such as:

- 1. Take the number in location 100 and bring it into accumulator A.
- 2. Add the number in memory location 101 to whatever is already in accumulator A.
- 3. Store the number from accumulator A into memory location 102.

If the three numbers are larger than what can be stored in just a single eight-bit memory location, then they might be split up among several consecutive locations, and the machine- or assembly-language program to perform a simple C = A + B equation might consist of dozens or even hundreds of steps.

# Produced in U.K. and widely used in England and USA COMPLETE BUSINESS PACKAGE

# INCLUDES EVERYTHING FROM INVENTORY TO SALES SUMMARY. PROMPTS USER AND VALIDATES ENTRIES. MENU DRIVEN

BUS VER 3.00 to VER 9.00 PET and CP/M.

Approximately 60-100 entries/input require 2-4 hours weekly and entire business is under control

* PROGRAMS ARE INTEGRATED 01 = *ENTER NAMES & ADDRESSES
02 = *ENTER/PRINT INVOICES
03 = *ENTER PURCHASES
04 = *ENTER A/C RECEIVABLES
05 = *ENTER A/C PAYABLES
06 = *ENTER/UPDATE INVENTORY
07 = ENTER/UPDATE ORDERS
08 = *ENTER/UPDATE BANKS
09 = *EXAMINE/REPORT SALES LEDGER
10 = *EXAMINE/REPORT PURCHASE LEDGER
11 = *MONITOR INCOMPLETE RECORDS
12 = *EXAMINE PRODUCT SALES
ENTER WHICH ONE ?

SELECT FUNCTION BY NUMBER...

13 = \*PRINT CUSTOMERS STATEMENTS...

14 = \*PRINT SUPPLIERS STATEMENTS...

15 = \*PRINT AGENT STATEMENTS...

16 = \*PRINT TAX STATEMENTS...

17 = GENERAL HELP...

18 = ALTER VOCABULARIES...

19 = PRINT YEAR AUDIT...

20 = PRINT PROFIT/LOSS A/C...

21 = ENDMONTH MAINTENANCE...

22 = PRINT CASHFLOW FORECAST...

23 = ENTER PAYROLL NO RELEASE...

24 = EXIT SYSTEM....

DATABASE MANAGEMENT INCLUDES

\*\*\* FILE CREATE/DELETE/SEARCH. \*\*\* RECORD CREATE/DELETE/SEARCH/4 OPTION PRINT. \*\*\* RECORD SORT ANY FIELD ALPHA OR NUMERIC. \*\*\* INDEX SEARCH OR GENERAL SCAN/PRINT IN ANY FIELD (EG TOWN OR NAME). \*\*\* 4 ARITHMETIC FUNCTIONS TO USE AS CALCULATOR ON LAST 4 FIELDS. \*\*\* AUTO CHECK TO PREVENT DOUBLE ENTRY TO FILE MANAGEMENT SYSTEM, DYNAMICALLY ALLOCATING INFORMATION TO MINIMIZE DISK SPACE CONSUMPTION

VERY FLEXIBLE—EASY TO USE
G.W.COMPUTERS U.K. ARE THE PRODUCERS OF THIS BEAUTIFUL PACKAGE

VER 3.00 (EXC PROG 19,20,22,23) = 475.00, VER 4.00 INCLUDES AUTO STOCK-UPDATE = 575.00, VER 5.00 INCLUDES AUTO BANK UPDATE = 675.00, VER 6.00 IN CORE = 775.00, VER 7.00 (INC 19,20,22,23) NOT YET RELEASED = 875.00, VER 8.00 RANDOM ACCESS = 900.00, VER 9.00 TRANSLATEABLE = 975.00.

+ + + EACH LEVEL OVERRIDES LOWER ONE

NOTE!!! All versions, especially 9.00 use broad financial principles and 9.00 is one 16K core program releasing both disk drives for data storage, as well as being translateable into any foreign language.

### VE WILL NOT BE UNDERSO

16K MEMORY UPGRADE KITS for TRS-80\*, Apple II, (specify): Jumpers

2 for \$85 \$45 \$2.50

DP-8000

\$825

PRINTERS

#### **NEC Spinwriter**



change print fonts, 55 cps, bidirectional, 79

high resolution plotting, graphing,	
tional spacing: R.O.	\$2579
R.O. with Tractor Feed \$2679 KSR with Tractor Feed	\$2995
779 CENTRONICS TRACTOR FEED PRINTER Same as Radio Shack line printer I	\$969
737 CENTRONICS FRICTION & PIN FEED PRINTER 9 × 7 matrix	\$799
730 CENTRONICS FRICTION & PIN FEED PRINTER	\$629
7 x 7 matrix Same as Radio Shack line printer II	
P1 CENTRONICS PRINTER	\$269
Same as Radio Shack quick printer	
PAPER TIGER (IP440)	\$939
Includes 2K buffer and graphics option	
TI-810 Faster than Radio Shack line printer III	
Parallel and serial w/TRS-80* interface software	
with upper and lower case and paper tray	\$1599
OKIDATA Microline 80 Friction and pin feed	\$559
Tractor Feed, friction, and pin feed	\$679
EATON LRC 7000 + 64 columns, plain paper	\$299

#### DP-9500 DISK OPERATING SYSTEMS

PATCHPAK #4 by Percom		•	TO LIVIO	\$	8.95
CP/M® for Model I, Zenith	\$145	•	for Model II, Altos	\$1	69.00
NEWDOS Plus			40 track	\$	99.00
NEWDOS 80				\$1	35.00

\$1359

#### **ACCESSORIES**

**ANADEX** 

HEAD CLEANING DISKETTE: Cleans drive Read/Write head in 30 seconds. Diskettes absorb loose oxide particles, fingerprints, and other foreign particles that might hinder the performance of the drive head. Lasts at least 3 months with daily use. Specify 51/4" or 8". \$20 ea/\$45 for 3

FLOPPY SAVER: Protection for center holes of 51/4" floppy disks. Only 1 needed per diskette. Kit contains centering post, pressure tool, tough 7-mil mylar reinforcing rings. Installation tools and \$11.95 rings for 25 diskettes.

Re-orders of rings only \$ 7.95 EXTERNAL DATA SEPARATOR: Eliminates data separation problems (crc). Improves reliability. This plug in unit comes fully \$29.95 assembled and tested. **RS232** \$84.00

DISK-DRIVE EXTENDER CABLES: Fits all mini-disk drives

DIGITORIAL EXILABEL OADELO. I Ito all millions and		
SIX (6) PRONG ISOLATOR	\$16.95 \$54.00	
AC FILTER/6 PRONG POWER STRIP	\$39.00	
DISK DRIVE CABLES: 2 drive \$29.00 4 drive	\$35.00	
DUST COVERS: TRS-80/Apple	\$ 7.95	
PLASTIC DISKETTE HOLDER	\$ 8.00	
RF MODULATOR: Adapts video to TV		
TRS-80 & OTHER MYSTERIES	\$35.00 \$18.95	
CAT MODEM Originate and answer same as Radio Shack Telephone Interface II	\$148	
LEEDEX MONITOR Video 100	\$119	
ZENITH Color Monitor	\$379	
SANYO Model VM 4509 Monitor	\$179	

#### **DISK DRIVES**

\$314

40 track, 102K Bytes. Fully assembled and tested. Ready to plug-in and run the moment you receive it. Can be intermixed with each other and Radio Shack drive on same cable. TRS-80\* compatible silver enclosure. 90 day warranty. One year on power supply. External card edge included.

	oura ougo moracou.	
FOR TRS-80		
CCI-100	51/4", 40 Track (102K Bytes) for Model I	\$314
CCI-280	51/4", 80 Track (204K Bytes) for Model I	\$549
CCI-800	8" Drive for Model II (1/2 Meg Bytes)	\$795
For Zenith Z	89	
CCI-189	51/4", 40 Track (102K Bytes) add-on drive	\$394
Z-87	Dual 51/4" add-on drive system	\$995
	<ul> <li>Box of 10 (5¼") - with plastic library case density for Model II (box of 10)</li> </ul>	\$24 \$36

#### COMPLETE SYSTEMS

OCIVII EEIE	OIGILING	
ALTOS 64K, DD, SS,	2-Drive, 1MB	\$3995
TRS-80* Model II-64	K	\$3499
TRS-80* LEVEL II-16	K with keypad	\$689
TRS-80* Expansion	Interface	\$249
APPLE 16K		\$989
<b>HEWLETT PACKAR</b>	D HP-85	\$2999
ZENITH Z89, 48K all-	in-one computer	\$2555
ZENITH Z19	•	\$740
TELEVIDEO	912B \$745	920B \$769
ATARI 400 \$489		ATARI 800 \$769
APF	M1000 \$99	IM-1 \$499
MATTEL INTELLIVIS	SION	\$249

#### SOFTWARE FOR THE TRS-80\* Software

INTELLIGENT TERMINAL SYSTEM ST-80-III BY LANCE MIKLUS: Enables a TRS-80\* to act as a dialup terminal on any standard time sharing network. Provides a TRS-80\* with control key, ESC Key, Repeat Key, Rub Out Key, Break Key, full upper and lower case support, selectable printer output and program selectable transmission rates \$139

CCA-DATA MANAGEMENT SYSTEM: Automate your information processing tasks. You can create a file of customer information; quickly and easily add, delete or update records; search a file; keep a file in order of the value in any fleld; and print records and labels in any desired sequence or from just a part of a file. Requires 32K TRS-80 and one drive.

S & M SYSTEMS INSECTION. IN SECTION 1. IN SE

may be spread over multiple disks. Machine language processing from your basic program, Utility program to convert direct files to INSEQ-80 format. \$49.95

FULLY INTERACTIVE ACCOUNTING PACKAGE: FULLY INTERACTIVE ACCOUNTING PACKAGE:
ISAM (INSEC.-80) based, includes General Ledger,
Accounts Payable, Accounts Receivable and Payroll.
System runs "stand alone" or "co-oriented G/L" at users option. Based on Osborne accounting method.
Requires 32K, TRS-80, 2 or 3 drives. N/A CA.

General Ledger
Accounts Receivable
Accounts Payable
Payroll"

990
Osborne books: Req'd as additional documentation
\$20 ea

INVENTORY Requires 32K, TRS-80, 1 drive \$125 INSORT-80: Callable form BASIC via USR. Sorts "Random" Disk Files. "Disk" to "Disk" sort times — 350 records in 3 secs, 1000 records in 6 minutes, 3500 records in 12 minutes. Machine language processing. Up to 35 sort keys ascending/descending. Utility to build BASIC program. Runs under NEWDOS. \$49.95

#### CP/M BASED SOFTWARE for Zenith, Altos, Radio Shack, Apple Software Manual

Z-80 SOFTCARD FOR APPLE: Your key to future soft-ware expansion. Get the best of both worlds, Apple's 6502 and CPIM Z-80. Plug in the card and get a Z80. Supports Apple language card and all Apple peripher-als. Comes with set of three manuals.

CCI-TELNET VERSION 5: A communication Package which enables microcomputer users to communicate both with Large Mainframes and other microcomputers. Extensive commands make it useful in many applications where communication between computers is necessary. Powerful terminal mode enabling

user to save all data from a session on disk. Com-pletely CP/M compatible. Multiple communication protocols supported. Able to transfer files in both directions without protocol where the other machine does not support any protocol. Extensive ON-SCREEN help. Source code provided.

MICROPRO-WORD-STAR: Menu driven visual word processing system for use with standard terminals. Text formatting performed on screen. Facilities for text paginate, page number, justify, center and underscore. User can print one document while simultaneously editing a second. Edit facilities include global search and replace. Read/Write to other text files, block move, etc. Requires CRT terminal with addressable cursor positioning.

DEALER (NATIONAL/INTERNATIONAL) INQUIRIES INVITED

#### Send for FREE Catalogue

# 256

TO ORDER CALL TOLL FREE 1-800-343-6522

Massachusetts residents call (617) 242-3361

For detailed technical information, call 617/242-3361

Hours: 10AM-6PM (EST) M-F (Sat. till 5)

\*TRS-80 is a Tandy Corporation Trademark

Digital Research

5 Dexter Row, Dept. K10M Charlestown, Massachusetts 02129

Massachusetts residents add 5% sales tax

Quantities on some items are limited





The days of complicated, unreliable, dynamic RAM are gone:



INTRODUCING

the ultrabyte memory board

complete kit

Netronics consistently offers innovative products at unbeatable prices. And here we go again - with JAWS, the ultrabyte 64K S100 memory board.

#### ONE CHIP DOES IT ALL

JAWS solves the problems of dynamic RAM with a state-of-the-art chip from Intel that does it all. Intel's single chip 64K dynamic RAM controller eliminates high-current logic parts . . . delay lines . . . massive heat sinks . . . unreliable trick circuits.

#### **REMARKABLE FEATURES OF JAWS**

Look what JAWS offers you: Hidden refresh . . . fast performance . . . low power consumption . . . latched data outputs . . . 200 NS 4116 RAMs . . . on-board crystal . . . 8K bank selectable . . . fully socketed . solder mask on both sides of board . . . designed for 8080, 8085, and Z80 bus signals . . . works in Explorer, Sol, Horizon, as well as all other well-designed \$100 computers.

GIVE YOUR COMPUTER A BIG BYTE OF MEMORY POWER WITH JAWS — SAVE UP TO \$90 ON INTRODUCTORY LIMITED-OFFER SPECIAL PRICES!

UNDECIDED? TRY A WIRED 16K JAWS IN YOUR COMPUTER ON OUR 10-DAY MONEY- BACK OFFER (SPECIFY YOUR COMPUTER).

CONTINENTAL U.S.A. CREDIT CARD BUYERS OUT SIDE CONNECTICUT CALL

**CALL TOLL FREE 800-243-7428** 

ETRONICS RESEARCH & DEVELOPMENT LTD.

333 Litchfield Road, New Milford, CT 06776

□ JAWS 16K RAM kit, No. 6416, \$199.95.\* JAWS 16K RAM fully assembled, tested, burned in,

- No. 6416W, \$229.95.\* ☐ JAWS 32K RAM kit, No. 6432, (reg. price \$329.95),
- SPECIAL PRICE \$299.95.\* ☐ JAWS 32K RAM fully assembled, tested, burned in, No. 6432W, (reg. price \$369.95), SPECIAL PRICE \$339.95.\*
- JAWS 48K RAM kit, No. 6448, (reg. price \$459.95), SPECIAL PRICE \$399.95.\*
- JAWS 48K fully assembled, tested, burned in, No. 6448W, (reg. price \$509.95), SPECIAL PRICE \$449.95.
- JAWS 64K RAM kit, No. 6464, (reg. price \$589.95), SPECIAL PRICE \$499.95.\*
- JAWS 64K RAM fully assembled, tested, burned in, No. 6464W, (reg. price \$649.95), SPECIAL PRICE
- Expansion kit, JAWS 16K RAM module, to expand any of the above in 16K blocks up to 64K, No. 16EXP, \$129.95.\*
- All prices plus \$2 postage and handling. Connecticut residents add sales tax.

Total enclosed: \$	
Personal Check	☐ Money order or Cashiers Check
□ VISA	☐ MASTER CHARGE (Bank No )
Acct. No	Exp. Date
Signature	
Print Name	)
Address	
City	

Zip.

Z 80 Processor Full Size ASCII Keyboard Calculator Style Numeric Pad 8K RAM (up to 48K RAM) Resident 4K Monitor ROM Interchangeable ROM Pacs

Dual Cassette I/O Serial and Parallel I/O 30 x 64 Character Display 240 x 512 Graphics Resolution 128 User Definable Characters S-100 Compatable

Purchase 16K RAM Sorcerer II at the Regular List Price and Receive 32K of Free RAM Installed for a Total of 48K RAM.

#### **\$**1295

WE PAY ALL SHIPPING AND HANDLING WITHIN THE U.S. Connecticut residents please add 7 1/2% sales tax.

#### MICRO DISCOUNT SERVICE

243 Old Colony Road Eastford, Conn. 06242 (203) 974-1214

#### MAXELL® OR W Dysan

Some computerists pay less - but may not receive Shuggart<sup>o</sup> or IBM<sup>o</sup> approved disks.

SINGLE SIDE DOUBLE DENSITY......Box of 10 for \$60

DOUBLE SIDE
DOUBLE DENSITY......Box of 10 for \$70 51/4" MINI ...... Box of 10 for \$50

8

WANG

(Specify - 8" Soft or Hard Sector/5" Soft or Hard Sector)





238 EXCHANGE STREET CHICOPEE, MA. 01013

413 - 592 - 4761

V 141

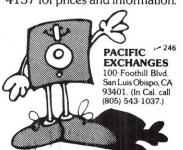
established 1960 · closed mondays

TI/99-4

#### **MEMOREX** DISKETTES & CARTRIDGES

for your computer or word processor

BUY THE BEST FOR LESS. Lowest prices. WE WILL NOT BE UNDERSOLD!! Buy any quantity. Call free (800) 235-4137 for prices and information.



#### 12" BLACK & WHITE LOW COST VIDEO TERMINAL

Easily interfaced with Radio Shack TRS 80

\$159.00 LIST

Will sell 6 feet coaxial cable \$5.00 Texas residents add 5% sales tax. Add \$5 for shipping and handling



limited warranty Ilmited warranty

Ilmited warranty

Ideal for home, personal and business computer systems;
surveillance inonitors \* 12" diagonal video monitor \* Composite video input \* Compatible with many computer
systems \* Solid-state circuitry for a stable & Sharp picture \* Video bandwidth—12 MHz ± 3 DB \* Input impedance—75 Ohms \* Resolution—650 lines Minimum IN
Central 80% of CRT; 550 Lines Minimum beyond central 80%
of CRT ref EIA RS-375 \* Dimensions—11.375" high; 16.250"
wide: 11.250" deep (exclude video input con-

video input wide; 11.250" deep (exclude nector) • Weight—6.5 KG (14.3 lbs) net

Use Master Charge/Visa or send money order.

#### **Micro Products Unlimited**

P.O. Box 1525, Arlington, TX 76010 817/461-8043

Dealer inquiries welcome

#### ATARI 800 16 K \$799 commodore Pet 16K \$799 EXIDY Sorcerer

\$999+ 16 K

Call or write for price list with comparable savings on a full line of peripherals and other name brands

icro Computer

arehouse

- Computers are fully tested and burned in for 48 hours.
- ◆Cash price-add 2% for Visa/ Mastercharge. Price subject to change without notice.

#### SURPLUS ELECTRONICS



ASCII

IBM SELECTRIC **BASED I/O TERMINAL** WITH ASCII CONVERSION **INSTALLED \$645.00** 

- Tape Drives Cable
- Cassette Drives Wire Power Supplies 12V15A, 12V25A, 5V35A Others, • Displays • Cabinets • XFMRS • Heat

Sinks • Printers • Components Many other items. Send for free catalog.

**WORLDWIDE ELECT. INC.** 130 Northeastern Blvd.

Nashua, NH 03062 Phone orders accepted using VISA or Master Charge

Send me more information

#### TRS-80 & OTHER NEEDS FILLED FOR LESS

- + + + COMPATIBLE DISK DRIVES WITH POWER SUPPLY AND CASE—120 DAY WARRANTY + + +
- \* 40 TRACK (204,800 BYTE/DISK) USE BOTH SIDES, ANTI-CRIMP/POWER PROTECT \$329 \*8 IN. DRIVE & P.S./CASE \$749 WITH P.S./CASE FOR 3 DRIVES
- \* 80 TRACK (204.8K BYTE) 90 DAY WARRANTY
- \* 4-DRIVE CABLE \$28 \*\* 10 DISKS-5 IN. @ \$24-8 IN. @ \$36HARD CASE \$3 & 5
- \*\*\* BASE 2 PRINTER-(60 LINE/MIN, 72,80,96,120 or 132 CHAR. LINE BI-DIRECT DOT MATRIX IMPACT 96 CHAR ASCII, 15 BAUD RATES) \$499 2K BUFFER, GRAPHICS, & TRACTOR OPTION AVAIL.\*\*\*
- \$839
- \* HARRIS SELECTRIC (WORD PROCESSING-TYPEWRITER & PRINTER)
- \* LOWER CASE FOR CENTRONICS 779/RADIO SHACK LINE PRINTER 1-EASY INSTALL
- \* UPS (UNINTERRUPTIBLE POWER SUPPLY) PREVENT POWER DROP SURGE OR OUT? FROM
- \* CAT MODEM (ORIG/ANS) \$144 16K MEMORY SET (200 NANO) +++++++
- \$44 \* 16K L2 RADIO SHACK COMPUTER SYSTEM \$649 \* APPLE, ATARI, RADIO SHACK MODEL 1/2 HARDWARE/SOFTWARE DISCOUNTED A/R, A/P, G/L, P/R FOR
- \$360 or \$100 EA. (MODEL 1) & \$630 OR \$165 EA. (MODEL 2). APPLICATIONS INTERACT & ARE COMPLETE & PROFESSIONAL. WILL RUN ON OTHER COMPUTERS. THIS IS A SPECIAL INTRODUCTORY PRICE.
- ASK FOR FREE FLYER WITH OUR LOW PRICES—DEALER INQUIRIES INVITED MASS. RESIDENTS ADD 5% TAX-F.O.B. TEWKSBURY-FREIGHT EXTRA.

M/C, VISA OR CHECK ACCEPTED. TRS-80 IS A REG. TRADEMARK OF TANDY CORP.

V 140

\$790

\$99.95

\$195

OMNITEK SYSTEMS \_ 24 MARCIA JEAN DR., DEPT. K, TEWKSBURY, MA 01876 CALL 617-851-3156



to the IBM Electronic Typewriter Mod 50, 60 or 75. Aside from yielding the best looking printouts and listings you'll ever see, our system lets you center titles, underline words & phrases, justify numerical columns, indent text and more – from your own programs and most others. Right justified proportionally spaced typesetting is even possible with the IBM50! The most cost effective word processor ever. (this ad is an example) \$25000

#### SOFTWARE also available for any TRS80:

SUPERDIR - displays a menu like directory in DOS from which you can RUN or KILL any program, display updated FREE space  $\epsilon$  print the display, all with single key commands. In fast acting Z80 code, only \$14.95 (DOS).

INMOD3 - easily used Z80 system program that can give any BASIC program professional keyboard entry. Blinking cursor, upper/lower case, user defined input length, repeat keys & single keystroke control codes. Makes INKEY\$ obsolete; saves 1000 bytes over BASIC equivalent; for the rankest amateur! \$14,95 (L2 or DOS).

INMOD3 Plus - same but works with Percom "Speak 2 Me": each character is spoken as entered! \$19,95

\* \* \* INTRODUCING our new MX80 FIRMWARE Interface and Modules. Software now in hardware form; utilizes the unused 2K lower mem. Write or call. VISA 8 MC. Dealers encouraged!

PO Box 8775 Universal City, CA. 91608 213-475-9949



#### THE SPIKE-SPIKERTM with transient absorber and filters **Computer Power Console**

- Protects computer equipment from most power line transients
- Provides convenience of plugging all computer equipment into one unit and simply switching the equipment on and P Eliminates constant plugging and off in required sequential order
- Provide RF "hash" filtering between computer and motorized equipment in the computer system, home or office to help prevent interference
  - unplugging of power cords

\$59.95

The Spike-Spiker has 8 individually switched 120 VAC outlets divided into two rows of separate filtered circuits of 4 outlets each, main on/off switch, fuse, and indicator light. Prewired and ready to use

Plug your CPU, interface, etc. in one filtered set of 4 outlets and your disks and printer in the other set of 4 outlets. This allows RF "hash" filtering to help prevent interference between the the computer and its peripheral motorized equipment



ELECTRONICS CO., INC.

COLONY DR. I.P. P.O. BOX 2062 BETHLEHEM, PA 18001 **OUT OF STATE** 800-523-9685 215-865-0006

# publication is



Please send me additional information. **University Microfilms International** 

300 North Zeeb Rd. Dept. P.R. Ann Arbor, MI 48106 U.S.A.

18 Bedford Row Dept. P.R. London, WC1R4EJ England

#### **SAVE MORE THAN 20%**

NORTH STAR — INTERTUBE — MICROTEK ZENITH - RCA-COSMAC - ITHACA THINKER TOYS — GODBOUT — SUPERBRAIN

The smartest computers at the smartest price



FACTORY ASSEMBLED & TESTED	LIST ON	LY
HORIZON-1-32K-DOUBLE DEN	\$2695	1994
HORIZON-2-32K-DOUBLE DEN	3095	2299
HORIZON-2-32K-QUAD DENSITY	3595	2699
HORIZON-2-64K-QUAD+HARD DISK	9329	7199
	16K 389 32K	
HORIZON MEMORY KIT	16K 359 32K	535
NORTH STAR HARD DISK 18 Mb	4999	3939
PASCAL FOR NORTH STAR ON DISK	199	190
PASCAL FOR NORTH STAR ON DISK Powerful NORTH STAR BASICThe Best		FREE
2 NORTH STAR SOFTWARE DISKS w/HORIZON		.FREE
NSSE 1-22 & PO1 TERRIFIC PROGRAMS		
NORTHWORD 299 MAILMAN 239		369
RCA-COSMAC VP-111 99 RCA-COSMAC	VP-711	189
COLOR! RAINBOW 385 CAT-100 1369	SPECTRUM	289
	3195	
ITHACA FRONT PANEL COMPUTER 64K Z-8001 CPU CARD 16-bit ITHACA S-100 8Mb		1179
ITHACA MEMORY 8/16-bit 64K	995	845
SEATTLE 8086 CPU 16 bit 10 x faster		556
SEATTLE MEMORY 8/16 BIT 16K 4Mhz		356
SSM KITS Z-80 CPU 221 VIDEO BRD VE	3 4Mhz	412
MEASUREMENT MEMORY 64K A & T 4mHz		599
MEASUREMENT MEMORY 64K BANK SELECT		789
ECONORAM XIV UNKIT 16K	299	254
CENTRAL DATA 64K RAM	665	599
DISCUS/2D A & T + CP/M	1199	975
THINKER TOYS HARD DISK 26 Mb	4995	3995
DISCUS/2+2 1.2 Mbytes A & T	1549	1285
TARBELL DISK CONTROLLER DD	495	445
TARBELL CASETTE INTERFACE KIT	120	109
SUPERBRAIN	2995	2395
SUPERBRAIN QUAD DENSITY	3995	2995



A. Commenter		
ZENITH-HEATH Z-89 48K	2895	2495
INTERTUBE II SMART TERMINAL	995	725
ZENITH-HEATH SMART TERMINAL	995	739
ZENITH-HEATH WH-11 16bit COMPUTER		2995
CAT NOVATION MODEM	179	169
MICROTEK PRINTER	795	675
ANADEX PRINTER DP-8000	995	865
ANADEX PRINTER DP-9500-1	1650	1389
NEC PRINTER Fast Typewriter Quality	2915	2799
SECRETARY WORD PROCESSOR The Best!	85	77
TEXTWRITER III Book Writing Program	125	112
GOFAST NORTH STAR BASIC Speeder Upper	79	71
PDS SUPER Z-80 ASSEMBLER & More	99	89
SUPER BASIC DEBUGGER \$89 COMPILER 135	HDS	40
EZ-80 MACHINE LANGUAGE TUTOR 25 ST	ATISTICS	190
EZ-CODER Translates English to BASIC	79	71
ECOSOFT FULL ACCOUNTING PKG	350	315
BOX OF DISKETTES 29 IN PLASTIC CA		30
Which Computers are BEST? BROCHURE		FREE
North Star Documentation refundable w/HRZ		20

ORDER 2 or more COMPLITERS ... BIGGER DISCOUNTS YES WE WILL BEAT OUR COMPETITION'S PRICE! FACTORY ASSEMBLED & FACTORY WARRANTY

#### **AMERICAN SQUARE COMPUTERS**

**KIVETT DR \* JAMESTOWN NC 27282** (919)-889-4577

# What Is the Utility Of a Utility?

#### A profusion of information at a low cost, for one.

Frank J. Derfler, Jr PO Box 691 Herndon, VA 22070

he unique data base held by the typical home computer user could probably be kept as easily in a loose-leaf notebook or a stack of 3 × 5 cards. Each user has disks or cassettes full of programs, but they are many of the same programs other computer users have. The amount of data unique to each individual is limited.

Economically, it makes sense to centralize the computing capability in one system, which professionals can maintain, program and interface. Individuals can subscribe to the centralized system and share both the reasonable cost and huge capabilities. Businesses and corporations have been doing this with time-sharing services for years, but time-shared large computer systems have not been economically available to individuals in the United States.

#### **Hobby Systems**

Computer hobbyists solved the problem in their own way by establishing services using microcomputers and one-at-a-time call-in access. These are known as Computer Bulletin Board Services, Apple Bulletin Board Services or Forum-80. They generally provide a public message capability, often can transfer programs and sometimes allow running programs. But they have little or no capability for storing individual files.

Such services fill a big gap between home systems and large time-shared mainframes, but they do not have the storage or the access to large data bases unique to big computer utilities. Individuals in other countries have been using and enjoying the services a large computer can provide (see "Ultimate Consumer Computer," Microcomputing, October 1979, p. 94). These services are now available to you via the telephone and your own computer or home terminal.

#### The Source

This system is the biggest and the best to arrive on the scene in a long time. I will not be too specific about the features of The Source, because they change so fast.

An information utility is an entry into the public data base in an interactive mode. This public data base includes information you would see in the newspapers: stock reports, business news, real estate, classifieds, travel, shopping hints and editorials. All of this information is sorted and cataloged and ready for recall according to your interests.

The Source provides both the UPI and New York Times news services. Real estate is a separate category, and listings, counseling and various running programs are available. The classified ads are divided into over 100 different categories, including an ac-

tive bulletin board service similar to hobby systems. Travel schedules and reservations, as well as shopping clubs, wine consultation, education programs and emergency services, are available.

The New York Times Consumer Data Base is a separate service acting as a current-events encyclopedia with articles on file from the N.Y. Times and over 60 other publications. An extensive mailbox system allows the transmission of private mail between individual users. You can review, read or send messages at any time. You can also store mail and forward it to other users. A chat mode is available for users who arrange to be on the system at the same time.

The Source operates on a Prime computer system, medium-sized hardware with about a megabyte of main solid-state memory and up to 295 megabytes of disk space. The Prime computer can also be used by subscribers to run BASIC and FOR-TRAN programs. Many standard programs are available, and the user can insert any unique programs and create files for permanent storage.

Connection between your home or office and The Source in McLean, Virginia, is done by dialing from your telephone to data transmission carriers, who make use of their own transmission facilities and facilities leased from other providers. Several different carrier systems exist in the U.S.

Carriers connect terminals to computers and computers to computers and provide the equipment to control the flow of data. They have some of their own microwave links and lease channels on microwave, satellite and cable systems from other major carriers. They reach their customers through the local dial telephone systems and a few dedicated lines to big users.

Their activities are regulated by

period occurs weekdays from 7:00 AM to 6:00 PM; the low period occurs any other time. The high-time cost is \$15 per hour, and the low-period cost is \$4.25 per hour for most services. Additionally, if you store data, you will pay 3.3 cents per 2048-character block per day.

The one area in which The Source could stand improvement is written documentation and explanation. The billing scheme is poorly explained.

You can buy a lot of five-dollar hours for all of the money you might spend on disk drives, memory and languages.

the FCC, ICC and Congress. They threaten and are being threatened by the post office and more traditional carriers. Despite this, they still manage to make a buck while providing more inexpensive service than the normal long-distance rate.

Telenet and Tymnet are two of these systems used by The Source. These services have over 300 entry points across the country. If you are near an entry point, you will have no long-distance toll charges.

When I lived in Montgomery, Alabama, the two nearest entry points were Birmingham and Atlanta. Birmingham was closer, but a call to Atlanta was less expensive because of the interstate rate structure. I had to pay for a long-distance call to Atlanta to use The Source, but the transmission from Atlanta to Virginia was paid for out of my user fee. I have been assured that data transmission services are going to mushroom in 1980.

A user needs a terminal and modem. The terminal can be a printer or a CRT. If it can save the information it receives for playback, retransmission or manipulation, it is a smart terminal. Smart or dumb terminals can be used on computer utilities. The modem connects the terminal to the phone line. The Bell 103/ originate modem at 300 baud is the standard for the services most of us are interested in.

This service is not free. Each user pays a one-time connect charge of \$100. Billing for computer and transmission service time is divided into low and high periods. The high High/low billing times are determined by recorded home address, regardless of where you are calling from.

Some services are never billed at the low rate. The management provides a loose-leaf binder with introductory information, but you have to spend several hours of serious study before you understand the services.

I am sympathetic to the difficulty involved in providing published documentation on a system evolving so quickly, but it certainly could be more descriptive. There are several different commands used to exit from specific services. If you don't use the correct command, you may not get out until you hang up the phone. Don't hang up without signing "OFF," or you may be billed for extra time.

The documentation is a small hurdle easily overcome with experience.

Other minor irritants are (1) the system sometimes crashes and leaves you hanging and (2) the system is often busy, particularly between 6 PM and 11 PM. I understand that computer expansion is coming, so both of these situations, common to many systems, should be improved.

The Source is a tremendous system with features previously seen only in dedicated military and educational networks. Its potential for growth is enormous, and I do not doubt that services such as this will be accessed in some form from the majority of the homes in the U.S. within seven years.

# MicroNet.

MicroNet is growing so quickly that

it is almost impossible to write about in a paper-and-print publication. It is a purer computer utility as contrasted to the information utility The Source claims to be. MicroNet, which is heavily targeting micro users, is a big time-sharing system used by many large government agencies and commercial corporations. It features resident software routines tailored for Apple and TRS-80 users. It does not provide the large public data base available through The Source, but it is less expensive to join. It has begun operation of a bulletin board message service and stock quotation service.

From my experience, I feel that MicroNet is more reliable than The Source. If you are mainly interested in programs and computing, MicroNet is a bargain. A one-time charge of \$9 and an off-hour rate of \$5 per hour allows you to use a tremendously powerful concentration of 15 mainframe computers running at least eight programming languages and a large menu of utility programs. You have to ask yourself why you would struggle to put together an extensive home computer system when that much power is available economically. You can buy a lot of five-dollar hours for all of the money you might spend on disk drives, memory and languages.

Each person must analyze his own interests and needs and buy accordingly. The spectrum from the 4K breadboard micro to the cluster of large mainframes has room for every system and user. Utilities such as Source and MicroNet add to the flexibility available to the hobbyist and small businessman. The expansion of these utilities and the carriers they use will bring an ever-increasing amount of power to the small user. If you decide to tap The Source, send a message to me at TCB967.

For information on The Source, contact Source Telecomputing Corp. (STC), 1616 Anderson Road, McLean, VA 22102.

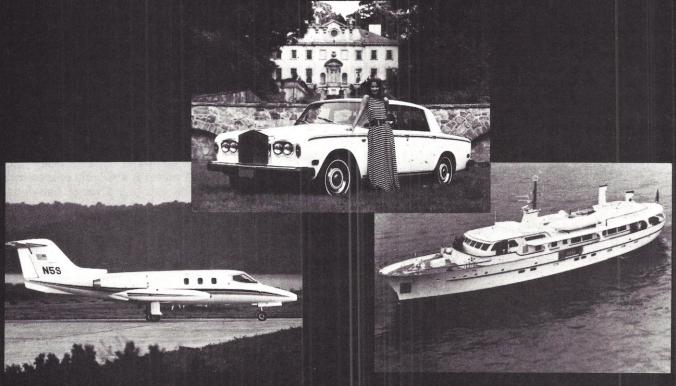
For information on MicroNet, contact Personal Computing Division, CompuServe, Incorporated, 5000 Arlington Centre Blvd., Columbus, OH 43220.

In mid-May, The Source issued a new Users' Manual and Master Index which provided much better explanations and was easier to follow than the old manual.

# Hundleds of Polls Royces, Yachts, Airplanes & Premium Properties

FOR SALE IN

# THE ROBB REPORT



THE ROBB REPORT, published monthly, is the market place for the buyer, seller and trader who appreciates the finer things in life. Listed for sale are hundreds of new and previously owned antique and classic motor cars, yachts, airplanes, premium properties horses, art, firearms and antique treasures. Complete descriptions and photographs are included, as well as the owner's name, address and telephone number.

A 12 month subscription to THE ROBB REPORT is \$45.00\*. Send your check to the address below, or you may charge your subscription to Visa, Master Card, American Express or Diners Club by calling 404-256-9470 and giving your card account number and expiration date.

# Pobbe port 120

THE ROBB REPORT/ P.O. Box 720317 - TF / Atlanta, Georgia 30328

\*Add \$30.00 for overseas subscription. Prices subject to change without notice.

# **Darkroom Computerist**

# Focus in on a "picture perfect" way to use your SWTP.

Marc I. Leavey, M.D. 4006 Winlee Road Randallstown MD 21133

believe quite a few "computerphiles" are interested in photography. Ask a few of your friends, and I bet you uncover someone with a closet darkroom. Listen to his gripes.

What irritates me is making a test exposure each time I change enlargement ratios, and setting up title slides for the numerous slide presentations I give. This article contains programs that make both these problems vanish.

# The Enlarger

Fig. 1 is a diagrammatic representation of a common photographic enlarger. The negative is placed in a carrier in the head, and a light source projects the image onto the easel - kind of like a vertical slide projector. On the easel is a piece of photographic paper, with a light-sensitive coating that reacts to the image to produce a print, obtainable after immersing that paper in a series of chemical baths.

The size of the image is regulated by the height of the head on the column, and the focal length of the lens. If you assume a constant lens, move the head up and the image gets larger, down and the image size decreases. However, the time the paper must be exposed is a function of the amount of light falling on it. Remember the inverse-square law? The light on that easel varies as the square of the height. Add to that the iris, a variable aperture that regulates the amount of light the head puts out in the first place, and you can see how things can become complicated.

# An Example

You finish making several 4 x 6 prints of the kids, then decide to shoot for an 8 x 10. So you raise the enlarger head, cropping a little until it looks "right," and make a test exposure. From that test you derive the new exposure values. set them up and make that big print. A knock on the door introduces your spouse, who wants "just a few wallet-sized for my folks." You crank the head way down. "Gee, that's bright!" Inverse-square law, you know. Maybe one or two test exposures later, some finished "wallets."

Why the fuss? Because each of those test prints costs you time and money . . . maybe not much if you are working in black and white, but color costs lottabucks! The pros realize this, and there are gizmos costing hundreds of dollars into which you program data on an "ideal print," that is, one you consider perfect. A probe reads the light on the easel and directs you or the enlarger to set the correct time and aperture to produce a perfect print.

# **Another Way**

Using that old inverse-square law, there is another way to do it. If you have data on a "perfect" print, expressed as height of enlarger head above the easel (HO) and time of exposure (To), the formula:

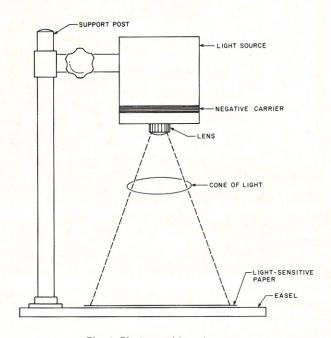


Fig. 1. Photographic enlarger.

```
0010 REM EXPOSURE TABLE PROGRAM
0020 REM
0030 REM VER 2.0 -- 11 APR 1979
         MARC I. LEAVEY, M.D.
0040 REM
0050 REM
0060 REM SET LINE LENGTH TO FULL WIDTH
0070 REM AND DIGITS TO FLOATING POINT
0080 LINE= 0: DIGITS=0
0090 REM BASE= 0 ALLOWS SUBSCRIPT OF 0
0100 REM AS IN F(0)
0110 BASE= 0
0120 REM READ IN F-STOPS
0130 FOR I=0 TO 5
0140 READ F(I)
0150 NEXT I
0160 DATA 4, 5.6, 8, 11, 16, 22
0170 HOME
0200 INPUT "WHAT KIND OF PAPER", PS
0210 PRINT "FOR A GOOD PRINT, WHAT IS:"
0220 INPUT "ENLARGER HEIGHT", S
0230 INPUT "UNITS (IN OR CM)", S$
0240 IF SS="IN" GOTO 260
0250 IF S$<>"CM" GOTO 230
0260 INPUT "EXPOSURE TIME (SEC)", T
0270 INPUT "F-STOP", F
0280 LET K=-1
0290 FOR I=0 TO 5
0300 IF F=F(1) THEN K=2+1
0310 NEXT I
0320 IF K>-1 GOTO 400
0330 PRINT "F-STOPS ON LENS ARE:"
0340 FOR I=0 TO 5
0350 PRINT F(I)
0360 NEXT 1
0370 GOTO 270
0400 PRINT "ENTER TABLE DELIMITERS:"
0410 INPUT "MINIMUM ENLARGER HEIGHT", MI
0420 INPUT "MAXIMUM ENLARGER HEIGHT", M2
0430 INPUT "INCREMENT OF HEIGHTS". I
0440 INPUT "PRINT TABLE ON WHICH PORT", P
0500 PRINT #P
0510 PRINT #P. TAB((30-LEN(P$))/2); P$
0520 PRINT #P. TAB((30-LEN(PS))/2);
0530 FOR J=1 TO LEN(PS)
0540 PRINT #P, "-";
0550 NEXT J
0560 PRINT #P
0570 PRINT #P
0580 PRINT #P. SS;
0590 FOR J=0 TO 5
0600 PRINT #P, TAB(5+5*J); F(J);
0610 NEXT J
0620 PRINT #P
0630 FOR D=M1 TO M2 STEP I
0640 PRINT #P. D;
0650 FOR N=0 TO 5
0660 LET Q=((((D/S)+2)+T)/K)+(2+N)
0670 IF Q<2 GOTO 710
0680 IF Q>99 GOTO 710
069 0 PRINT #P. TAB(5+5*N); INT(Q+.5);
0700 GOTO 720
0710 PRINT #P, TAB(5+5*N); "-- ";
0720 NEXT N
0730 PRINT #P
0740 NEXT D
0750 SKIP #P. 50-D
0760 INPUT "ANOTHER TABLE". AS
0770 IF LEFTS(AS, 1) = "Y" GOTO 200
0999 END
                    Program 1.
```

$$T_N = \left(\frac{H_N}{H_O}\right)^2 \times T_O$$

calculates the new time of exposure at the new height, if the same aperture is used.

Aperture is measured in f-stops, a logarithmic expression of how much light the enlarger is putting out. By reducing the expression to a common f-stop, you can produce factors that

allow calculation of correct time at any possible opening.

Integrating this idea into a workable scheme results in Program 1, written in SWTP BASIC. The program first specifies the type of paper used, as different photographic emulsions have different characteristics. Enter the data for a correct print: enlarger height, time for exposure and f-stop.

After requesting delimiters for a table, the program calculates the exposure time for the range of specified heights, at all available f-stops. Sample resultant tables for two different emulsions are shown in Sample runs 1 and 2. Different types of paper—one black and white, one color—illustrate the different requirements varied emulsions produce.

Note that times greater than 99 seconds or less than two seconds are not printed; a dash is inserted instead. This is in deference to most timers on the market today. Also, while printed times are rounded off to the nearest whole second, the actual values are used in calculations to maintain accuracy.

# **How to Use This Program**

Make a good exposure of an average negative. Feed the requested data into the computer, then take the table printed out to the darkroom. When you change enlargement ratios, simply measure the enlarger height and read the appropriate exposure time and f-stop off the table. An accurate, program-

# WAYS TO INCREASE YOUR COMPUTER & MICROPROCESSOR KNOW-HOW!

SEND NO MONEY! We'll Invoice you on 10-DAY FREE TRIAL. ALL BOOKS 100% GUARANTEED. You must be satisfied or return the books and we'll cancel the invoice.



1205-PASCAL A programprograms and helpful exercises! plain-fun applications—with You'll find out how to put to-actual programs, printouts, gether complete READ and flowcharts, diagrams and illust-WRITE programs, and use repetitive (looping) statements. applications right to work. Albuse them in writing and using most 100 games (including subroutines, in playing games, pool). 336 p., 100 il. Only etc. 350 p., 106 il. Only \$15.95 \$12.95 h; \$8.95 p. h; \$10.95 p.



mer's guide to using Pascal, Your Personal Computer Over Tiny Pascal and Supersoft Tiny 1,000 time-saving, money-Pascal . . including actual saving, effort-saving and just-programs and helpful exercises! plain-fun applications—with

focus is on the how-to of using and how to locate and repair microprocessor chips. 308 p., problems. 308 p., 229 il. Only 94 il. Only \$14.95 h; \$9.95 p. \$12.95 h; \$8.95 h.

& DIGITAL LOGIC 1160-1001 Things To Do With 1203-Handbook of Micro - 1183-Troubleshooting Mi- 1045-Programmer's Guide 1062-The A To Z Book of

TROUBLESHOOTING

processor Applications How to croprocessors & Digital Logic To Lisp A step-by-step, easyof applications, including interfacing and using machine language programming! Details that shows you how to do it all
machine decisions. This book is bleshoot digital/logic and micompletely practical ... while it croprocessor circuits, how to dig
machine decisions. This book is bleshoot digital/logic and micompletely practical ... while it croprocessor circuits, how to dig
machine decisions. This book is bleshoot digital/logic and micompletely practical ... while it croprocessor circuits, how to dig
machine decisions. This book is bleshoot digital/logic and micompletely practical ... while it croprocessor circuits, how to dig
machine decisions. This book is bleshoot digital/logic and mimachine decisions are decisions. This bleshoot di machine decisions. This book is bleshoot digital/logic and mi-completely practical . . . while it croprocessor circuits, how to dig contains some theory, its main into their operating systems,





gence language. Shows how to how the game works, what the write complete LIsP programs. program contains, plus valu-210 p., 117 il. Only \$9.95 h; able programming gems. 308 \$5.95 p.

1169—The Giant Handbook of Computer Projects. This MAMMOTH 504-page step-by-step guide to building modern computers and accessories—CPUs, memories, .1/0 hardware, etc.—is a builder's dream, with projects and schematics, parts lists, and step-by-step construction instructions to enable you to build your own systems. 504 p., 217 il. only \$15.95 h, \$9.95 .

1053 — Microprocessor Cookbook. A chip-y-chip comparison of the most oppoular modern microprocessors—including programming, architecture, addressing, instruction sets, and applications! 266 p., 124 il. only \$10.95 h, \$6.95 n.

addressing, instruction sets, and applications? 200 p., 124 li. only \$10.39

1111 — How to Design, Build & Program Your Own Working Computer
System. Inis 2-in-1 volume combines both hardware and software so you
can homebrew your own customized computer system complete from power
supply to terminals . . . . at one-third the cost of an equi-ralent commercial
unit! 308 p., 138 li. only \$14.95 h; \$9.35 p.

1088 — Illustrated Dictionary of Microcomputer Terminology. Here are clear,
concise, encyclopedic definitions of nearly 4,000 computer terms, "buzz"
words, and jargon currently being used in the exploding new field of
microcomputers. But it's more than just a dictionary—it's a through
update on what's happening in computers and related peripheral systems.
322 p., 150 ii. only \$12.95 h; \$7.95 p.
1076 — Artificial intelligence. An exciting, thought provoking guide to the
sophisticated techniques used to make machines "think." It carefully
defines artificial intelligence, explains the theory behind advanced computer programming, and shows you how to program your computer to assume
rudiments of humanlike intelligence. 252 p., 118 ii. only \$12.95 h; \$7.95 p.

1201 — The Complete Microcomputer Systems Handbook. A complete guide

1201 — The Complete Microcomputer Systems Handbook. A complete guide to microcomputers—how they operate, how to use them, how to program them, and how to troubleshoot and repair them... plus data on applications and the latest state-of-the-art concepts like magnetic bubble memories, computers in networks, teaching machines to learn, etc. 322 p... 147 il. only \$15.95 h; \$9.95.

1055-The Basic Cookbook. A step-by-step guide to writing and using micro- and mini-computer programs for everyday household, pastime, and business applications. Shows how to understand BASIC and write instructions, enter them into the computer, and interpret results. 140 p., 49 il. only

tions, enter them into the computer, and interpret results. 140 p., 49 il. only \$7.95 h; \$4.95 p.

1071—The Complete Handbook Of Robotics. How to design and build ANY kind of robot ... including ones with microprocessor "brains"—PLUS how to interface robots with computers! It's a single sourcebook that contains all the techniques you'll need for creating, designing, building, and operating your own robot. 364 p., 137 il. only \$12.95 h; \$7.95 p.

1066—The Illustrated Dictionary Of Electronics. Complete, modern definitions for well over 20,000 electronics/computer terms! It's an all-inclusive dictionary of technical terms that is up-to-date, well-organized and concise and designed to compare a clear meaning to any term 882 p. 472 il.

dictionary of technical terms that is up-to-date, well-organized and concise, and designed to convey a clear meaning to any term. 882 p., 472 ii. only \$19.85 h; \$14.95 p.
1077 — Handbook Of Remote Control And Automation Techniques. A complete guide to the application of electronic techniques to the solution of any remote control problem. Shows how to interface a minicomputer to control household devices 294 p., 250 ii. only \$12.95 h; \$73.95 p.
1099 — How To Build Your Own Working 16-Bit Microcomputer. A step-by-step description of how to construct a working 16-bit microcomputer, using the 9900 CPU microprocessor. Covers every type of interface required, and how to use it. 96 p., 73 ii. only \$3.95 p.
1077 — Computerist's Handly Manual. Brings together a wealth of data techniques and useful suggestions. Details all the facts needed to make a decision about bulk memory, keyboards, displays, hard-copy printers, etc. 64 p., 39 il. only \$2.95 p.
141 — How To Build Your Own Working Robot Pet. An incredible book that shows you how to construct your own microprocessor-based robot and

shows you how to construct your own microprocessor-based robot and program it—with full details on building an ultrasonic sonar distance measuring navigation system (Soniscan), a hearing method (Excom), a way

225 - Master Handbook Of Electronic Tables & Formulas - 3rd Edition. complete electronics reference library in a single volume—instant info. including charts and diagrams, for everyone in electronics! Contains data that will help you solve any problem or design any circuit! 322 p.,96 il. only 1206 — How To Design and Build Audio Amplifiers, Including Digital Circuits — 2nd Edition. A complete course in designing and building audio circuits for ALL electronics applications! Plenty of specialized information included. 350 p., 249 il. only \$15.95 h; \$9.85 p.

136—Practical Electronics Math. A comprehensive problem-and-solution study guide and reference on electronics math and theory (with actual worked-out examples) that covers ALL the concepts used in electronics, communications, electricity, etc! 504 p., 276 il.only \$15.95 h; \$10.95 p.

905 — Build-It Book Of Digital Electronic Timepieces. A data-packed guide to building every timekeeping device you can imagine —rugged shipboard clocks, second-splitting digital IC chronometers, decorator digital clocks, a precision timer, a frequency period meter, a tide and moon clock. 294 p. 209 il. only \$9.95 h; \$6.95 p.

reference index that lets you classify and identify thousands of different Its made by 40 manufacturers, so you can easily select the right Ic for a specific job, or quickly determine an IC's function. 224 p., 28 il. only \$8.95 h; \$5.95 p.

1241—How To Build Your Own Self-Programming Robot. Complete overthe-shoulder instructions on how to use the 8085 microprocessor to build Rodney Robot, a robot capable of thinking and learning. It's a straightforward how-to introduction to the sophisticated subject of robotics and machine intelligence, 23 pp., 103 il. only \$1.25 b; \$8.95 p.

1085—24 Tested, Ready-To-Run Game Programs In Basic. A challenging collection of fun and game programs in BASIC. ... with detailed program descriptions, sample printouts, and complete flowcharts, with adaptations for the TRS-80 and PET® home computers 24 different mind-testing games. 266 p., 23 il. only \$9.95 b; \$6.95 p.

955—Modern Digital Communications. A comprehensive guide to using, understanding, and troubleshooting modern digital communications systems ... all the facts about the latest hardware and techniques from the elementary setup to multiplexers 308 p., 122 il. only \$10.95 b; 8.95 p.

780—111 Digital & Linear IC Projects. A practical sourcebook of circuits—digital and linear—using off-the-shelf components. Complete spees and clear layout drawings are provided for every IC (including phase-locked loop IC's) featured, and detailed applications into including all the values needed to make it work. 210 p., 275 il. only \$9.95 b; \$5.95 p.

785—Computer Programming Handbook. A complete guide to computer programming and data processing, with scores of worked out examples. An extremely comprehensive, informative, and interesting work on digital computer programming and data processing with scores of worked out examples. An extremely comprehensive, informative, and interesting work on digital computer programming and data processing in general. 518 p., 114 il. only \$1.95 b; \$5.95 p.

841—Build Your Own Working Robot. Complete instructi

schematics, logic circuits, and wiring diagrams—for building Buster, the most unique pet in the world! Not for novices, Buster is a sophisticated experiment in cybernetics. A learning experience unparalleled in electronic construction. 238 p., 117 il. only \$8.95 h; \$5.95 p.

1070 — Digital Interfacing With An Analog World. A GIANT 406-page handbook that shows you how to design circuits to interface microprocessors, computers, telephones, and other digital devices with the analog world... that shows you how to really put your microcomputer to work. 406 p., 277 il. only \$12.95 h; \$9. 95 p.

measuring havigation system (sonscan), a hearing method (Excom), a way of talking (Audigen), and an understandable language and grammar (fredian), 238 p., 96 il. only \$10.95 h.; \$6.95 p.

995—Programs in BASIC For Electronic Engineers, Technicians & Experimenters. A broad range of problem-solving programs in computer BASIC, including BETA Distribution. Chebyshev High-Pass and Low-Pass Designers, Fourier Analysis, Op-Amp circuits, etc. 140 p., 26 il. only \$8.95 h.; \$4.95 p.

74 — Master Handbook Of Digital Logic Applications. A powerhouse of applications and design info on the latest digital devices and logic systems that covers more than common TTL. CMOS, noise-immune high-threshold logic (HTL), and emitter-coupled logic (ECL), too. 392 p., 308 il. only \$12,95 h; \$8.95 p.

000-57 Practical Programs And Games In Basic. 57 of the hardest vorking, most enjoyable BASIC programs you're ever seen... everything from space war games to blackjack, from craps to I Ching, from arithmetic progression to statistical permutations to one-arm bandits! 210 p., 64 il. only \$10.95 h; \$7.95 p.

785—Microprocessor/Microprogramming Handbook. An authoritative, practical guide to the construction, operation, programming and applications of microprocessors. Covers every aspect—inside and out, and illustrates microprogramming techniques to build up program loops, subtractives microprogramming techniques of build up program loops, subtractives microprogramming techniques of build up programming techni

precision timer, a frequency period meter, a tide and moon clock. 294 p. 209 ii. only \$9.95 h; \$5.95 p.

1199 — The Master IC Cookhook. "Use-it-now" info on every IC family and function — CMOS and TIL 4000- and 7400-series digital ICs.exotic CMOS, and function — CMOS and TIL 4000- and 7400-series digital ICs.exotic CMOS, and maximum ratings for all classifications of ICs. 476 p. 707 ii. only \$15.95 h; \$10. 95 p.

180 — IC Function Locator. A versatile new four-way, six-section cross-reference index that lets you classify and identify thousands of different ICs apsecific job, or quickly determine an IC's function. 224 p., 28 ii. only \$8.95 p.

180 — How To Build Your Own Custom TV Games. The COMPLETE book — a GIANT \$46-page volume—on designing, building, programming, and modifying all lately with detailed how-to-build-it instructions and complete game circuitry, with detailed how-to-build-it instructions and complete game circuitry. With detailed how-to-build-it instructions and complete game circuitry, with detailed how-to-build-it instructions and complete game circuitry. With detailed how-to-build-it instructions and course in CMOS devices — covers everything from CMOS logic operations to basic analog circuits! great the composition of the special policition of the about the latest subject of robotics and machine intelligence. 239 p., 103 ii. only \$1.29 b; \$8.95 p.

1085 — 24 Tested, Ready-To-Run Game Programs in Basic. A challenging descriptions, sample printouts, and complete flowcharts, with adaptations!

1095 — 24 Tested, Ready-To-Run Game Programs in Basic. A challenging descriptions, sample printouts, and complete flowcharts, with adaptations in displayment in the programs of the programs in the country of the device of

# 10-DAY FREE TRIAL-NO RISK COUPON

edition desir	me the books ed (p) paper (e s	s indicated b or (h) hard]:	elow. [specify
	ne on 10-day	trial (plus s	hipping)
☐ Charge my ' Minimum or	VISA or Master C	harge account (	(plus shipping).
	Book #	Book #	Book #
	empel to the		
Name		Phone	
Name Company_		Phone	
Company _		Phone	
Company Address	Sta		Zip
Company Address			Zip
Company Address City USA Card No. □□		ateaster Charge	



Before you buy the programs that your company is going to depend on for its accounting, ask the following questions:

Do I get the source code?

(Don't settle for less.
You cannot make the
smallest change without it.)
(The Osborne documentation is the best.)
(If not, why not? What are
they afraid of?)

Is it well documented?

Is it fully supported?

The Osborne system is the industry standard accounting package, with literally thousands of users. We offer an enhanced version of that package that will run on most systems without recompiling.

CRT INDEPENDENCE. The original programs were designed to run on a Hazeltine terminal. To use a different CRT, you had to modify and test two modules — and recompile every program! With the Vandata package, you simply pick your CRT from a menu and run.

FILE/DRIVE MAP. The original package had all data files on the same drive as the programs. Ours allows you to dynamically specify the drive assigned to each file. In fact, you can change the drive assignments whenever you wish, to accomodate expanded file sizes or new hardware — all without recompiling!

**INTEGRATION.** The original AR and AP systems had to be changed and recompiled to feed journal entries to GL. Our installation program eliminates this hassle. It simply asks you if you want the systems integrated, and what your special account numbers are.

**SPEED.** The original programs used a binary search to access the GL account file. We use an enhanced technique that greatly cuts down on disk accesses, thus speeding up account lookups significantly in the GL, AR and AP systems.

**BUGS.** We have corrected a number of bugs in the original programs. If you find a bug in our programs, we'll fix it — and send you a \$20 reward! Our users are sent bug fixes in source form.

**MORE!** We have made many minor enhancements, and fixed many minor problems. We are committed to the ongoing support of our package. Vandata has been an independent software supplier for over seven years. Quality and support are our way of doing business.

	General Ledger with Cash Journal	\$95
	Accounts Receivable	
	Accounts Payable	\$95
	Payroll with Cost Accounting	
•	All Four Packages (GL, AR, AP, PR)	
	Magic Wand (Super Word Processor!!)	. \$345
	Pearl Level III (best prog. tool available)	
	CBASIC-2	.\$110
	TRS-80 MOD II CP/M 2.2 (Pickles & Trout)	. \$185
	H89/Z89 CP/M 2.2 (Magnolia inc. h/w mod)	. \$295

Formats: Std. 8", 5" NorthStar DD, TRS-80 MOD II tm, H89/Z89, Superbrain DD. Manuals for GL, ARIAP, and PR are not included in price — add \$20 per manual desired (ARIAP are in one manual). CP/M and CBASIC-2 required to run accounting software. Users must sign licensing agreement. Dealer inquiries invited.

To order call: or write:

(206) 542-8370 VANDATA

17541 Stone Avenue North Seattle, WA 98133

VISA/MC Welcome — TRS-80 is a registered tm of Radio Shack, Inc.

mable timer, such as the one described in 73 Magazine, August 1977, pp. 66-71 ("Build a Unique Timer," WA3AJR), is an aid to setting repeatable times for this program.

# A Finishing Touch

You can use Program 2 to identify slides when you project them. This program is set up for a scrolling terminal, with H set to the number of characters per line and V set to the number of lines. It inputs up to three less than V lines, centers them and surrounds them with a border character of your choosing. If you don't want a border, you can use a non-printing single character such as CONTROL-G (BELL). A loop at the end ties things up until you take a picture of the screen.

I put titles on the screen and shoot them, after thoroughly cleaning the screen, with ASA 125 Plus-X at f/1.4, 1/8 second. I use a tripod and darken the room to eliminate reflections from the screen. The resultant negatives are a black-on-clear representation of my white-on-black background display and make snazzy title slides. You can mount them in slide mounts alone or, with a little creative planning, shoot them to sandwich with a color slide, producing a superimposed title.

```
0010 REM
          SLIDE TITLE MAKER
0020 REM
0030 REM VER 2.0 - 13 APR 79
0040 REM MARC I. LEAVEY. M.D.
0050 REM
0060 REM SET LINE LENGTH
0070 LINE= 0
0080 REM "H" = CHARACTER WIDTH OF SCREEN
0090 REM "V" = NUMBER OF LINES ON SCREEN
0100 LET H=32
0110 LET V=16
0120 DIM LS(V),L(V)
0130 INPUT "BORDER CHARACTER", B$
0140 IF LEN(BS)=1 GOTO 200
0150 PRINT "PLEASE TYPE ONLY ONE CHARACTER"
0160 GOTO 130
0200 LET K=0
0210 FOR N=1 TO V-3
0220 PRINT "LINE #"; N;
0230 INPUT LS(N)
0240 IF LEN(L$(N)) <= H-5 GOTO 300
0250 PRINT CHRS(7); "LINE TOO LONG!"; CHRS(7)
0260 GOTO 220
0300 IF LS(N)="#$" THEN N=N-1: GOTO 400
0310 LET L(N)=LEN(LS(N))
0320 IF L(N)>K THEN K=L(N)
0330 NEXT N
0400 LET I=K+4
0410 LET J=((H+1)-1)/2
0420 PRINT TAB(J);
0430 FOR M=1 TO I
0440 PRINT BS;
C450 NEXT M
0460 PRINT
0470 FOR M=1 TO N
0480 PRINT TAB(J); BS;
0490 PRINT TAB(((H+1)-L(M))/2); LS(M);
0500 PRINT TAB(I+J-1); B$
0510 NEXT M
0520 PRINT TAB(J);
0530 FOR M=1 TO I
0540 PRINT BS;
0550 NEXT M
0560 FOR M=1 TO V-(N+2)
0570 PRINT
0580 NEXT M
0590 REM LOOP TO KEEP THINGS BUSY
0600 GOTO 590
```

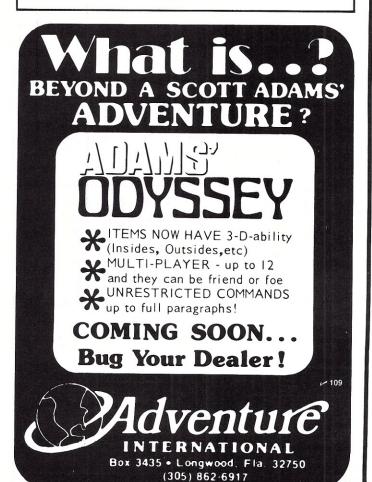
Program 2.

WHAT KIND OF PAPER ? CIBACHROME FOR A GOOD PRINT, WHAT IS: BNLARGER HEIGHT ? 21 UNITS (IN OR CM) ? IN EXPOSURE TIME (SEC) ? 10 F-STOP ? 5 F-STOPS ON LENS ARE: 5-6 8 16 22 F-STOP ? 4 BYTER TABLE DELIMITERS: MINIMUM ENLARGER HEIGHT ? 10 MAXIMUM ENLARGER HEIGHT ? 24 INCREMENT OF HEIGHTS ? 1 PRINT TABLE ON WHICH PORT ? 3

# CIBACHROME

IN	4	5.6	8	11	16	22
10	2	5	9	18	36	73
11	3	5	11	22	44	88
12	3	7	13	26	52	
13	4	8	15	31	61	
14	4	9	18	36	71	
15	5	10	20	41	82	
16	6	12	23	46	93	
17	7	13	26	52		
18	7	15	29	59		
19	8	16	33	65		
20	9	18	36	73		
21	10	20	40	80		
22	11	22	44	88		
23	12	24	48	96		
24	13	26	52			

Sample run 2.



# BUSINESS - PROFESSIONAL - GAME SOFTWARE FOR APPLE AND TRS-80

HOME FINANCE PAK I: Complete package \$49.95 Apple, TRS-80
BUDGET: The heart of a comprehensive home finance system. Allows user to define up to 20 budget items. Actual expense input can be by keyboard or by automatic reading of CHECKBOOK II.6. Costs are automatically sorted and compared with budget. BuJGET produces both monthly actual/budget/variance
report and a year-to-date by month summary of actual costs. Color graphics display of expenses \$24.95  CHECKBOOK II: This extensive program keeps complete records of each check/deposit. Unique check entry system allows user to set up common check purpose and recipient categories. Upon entry you select from this pre-defined menue to minimize keying in a lot of data. Unique names can also be stored for completeness. Rapid access to check files. Check register display scrolls for ease of review. 40 column print-
out. Up to 100 checks per month storage. Files accessible by BUIGET program
CREDIT CARD: Keep control of your cards with this program. Organizes, stores and displays purchases, payments and service charges. Screen or 40 column printer display. Up to 10 separate cards \$14.95
THE UNIVERSAL COMPUTING MACHINE: \$39.95 Apple, TRS-80  A user programmable computing system structured around a 20 row x 20 column table. User defines row and column names and equations forming a unique computing machine. Table elements can be multiplied, divided, subtracted or added to any other element. User can define repeated functions common to a row or column greatly simplifying table setup. Hundreds of unique computing machines can be defined, used, stored and recalled, with or without old data, for later use. Excellent for sales forecasts, engineering design analysis is, budgets, inventory lists, income statements, production planning, project cost estimates-in short for any planning, analysis or reporting problem that can be solved with a table. Unique curser commands allow you to move to any element, change its value and immediately see the effect on other table values. Entire table can be printed by machine pages (user-defined 3-5 columns) on a 40 column printer. Transform your computer into a UNIVERSAL COMPUTING MACHINE.
COLOR CALENDAR: HI-RES color graphics display of your personal calendar. Automatic multiple entry of repetitive events. Review at a glance important dates, appointments, anniversaries, birth-days, action dates, etc. over a 5 year period. Graphic calendar marks dates. Printer and screen display a summary report by month of your full text describing each day's action item or event. Ideal for anyone with a busy calendar. (Apple Only)
■ BUSINESS SOFTWARE SERIES: Entire package \$199.95 Apple, TRS-80  MICROACCOUNTANT: The ideal system for the small cash business. Based on classic T-accounts and double-entry bookkeeping, this efficient program records and produces reports on account balances, general ledger journals, revenue and expenses. Screen or 40 column printer reports. Handles up to 500 journal entries per period, up to 100 accounts, Instructions include a short primer in Financial Accounting. \$49.95
UNIVERSAL BUSINESS MACHINE: This program is designed to SIMPLIFY and SAVE TIME for the serious businessman who must periodically Analyze, Plan and Estimate. The program was created using our Universal Computing Machine and it is programmed to provide the following planning and forceasting tools.  CASH FLOW ANALYSIS PROFORMA BALANCE SHEET SOURCE AND USE OF FUNDS PROFORMA PROFITE & LOSS SALES FORECASTER JOB COST ESTIMATOR  Price, including documentation and a copy of the base program. Universal Computing Machine \$89.95
INVOICE: Throw away your pens. Use the ELECTRONIC INVOICE facsimile displayed on your CRT. The program prompts and you fill in the data. Includes 3 address fields (yours, Bill to and Ship to), Invoice No. Account No. Drder No. Salesman, Terms, Ship Code, FOB Pt. and Date. Up to 10 items per sheet with these descriptions: Item No. No. of units, Unit Price, Product Code, Product Description, Total Dollar amount per item and invoice total dollar amount. Generates, at your option, hard copy invoices, shipping memos, mailing labels, audit copies and disc updates to master A/R files. (48K)\$49,95
BUSINESS CHECK REGISTER: Expanded version of the Checkbook II program. Handles up to 500 checks per month with complete record keeping. (48K)
BUSINESS BUDGET: As described above and companion program to Business Check Register. Handles 500 transactions per month, up to 20 cost categories. Accesses BCR files for actual costs. (48K)\$29.95
■ ELECTRICAL ENGINEERING SERIES: Both programs \$159.95 Apple  □ LOGIC SIMULATOR: SAVE TIME AND MONEY. Simulate your digital logic circuits before you build them. CMOS, TTL, or whatever, if it's digital logic, this program can handle it. The program is an interactive, menu driven, full-fledged logic simulator capable of simulating the bit-time by bit-time response of a logic network to user-specified input patterns. It will handle up to 1000 gates, including NANDS, NORS, INverters, FLIP-FLOPS, SHIFT REGISTERS, COUNTERS and user-defined MACROS. Up to 40 user-defined, random, or binary input patterns. Simulation results displayed on CRT or printer. Accepts network descriptions from keyboard or from LOGIC DESIGNER for simulation. Specify 1000 gate version (48K required)
□LOGIC DESIGNER: Interactive HI-RES Graphics program for designing digital logic systems. A menu driven series of keyboard commands allows you to draw directly on the screen up to 15 different gate types, including 10 gate shape patterns supplied with the program and 5 reserved for user specification. Standard patterns supplied are NAND, NOR, INVERTER, EX-0R, T-FLOP, JK-FLOP, D-FLOP, RS-FLOP, 4 Bit COUNTER and N-BIT SHIFT REGISTER. User interconnects gates just a you would normally draw using line graphics commands. Network descriptions for LOGIC SIMULATOR generated simultaneously with the CRT diagram being drawn. Drawing is done in pages of up to 20 gates. Up to 50 pages (10 per disc) can be drawn, saved and recalled. Specify 1000 gate (48K) or 500 gate (32K) system
MATHEMATICS SERIES: Complete Package \$49.95 Apple only
NUMERICAL ANALYSIS: HI-RES 2-Dimensional plot of any function. Automatic scaling, At your option, the program will plot the function, plot the INTEGRAL, plot the DERIVATIVE, determine the ROOTS, find the MAXIMA and MINIMA and list the INTEGRAL VALUE. For 16K\$19.95
MATRIX: A general purpose, menu driven program for determining the INVERSE and DETERMINANT of any matrix, as well as the SOLUTION to any set of SIMULTANEOUS LINEAR EQUATIONS. Disk I/O for data save. Specify 55 eqn. set (48K) or 35 eqn. (32K).
☐ 3-D SURFACE PLOTTER: Explore the ELEGANCE and BEAUTY of MATHEMATICS by creating HI-RES PLOTS of 3-dimensional surfaces from any 3-wariable equation. Disc save and recall routines for plots. Menu driven to vary surface parameters. Demos include BLACK HOLE gravitational curvature equations. \$19.95
ACTION ADVENTURE GAMES SERIES: Entire series \$29.95 Apple only  RED BARON: Can you outfly the RED BARON? This fast action game simulates a machine-gun DOG- FIGHT between your WORLD WAR I BI-PLANE and the baron's. You can LOOP, DIVE, BANK or CLIMB in any one of 8 directions - and so can the BARON. In HI-RES graphics
BATTLE OF MIDWAY: You are in command of the U.S.S. HORNETS' DIVE-BOMBER squadron. Your targets are the Aircraft carriers, Akagi, Soryu and Kaga, You must fly your way through ZEROS and AA FIRE to make your DIVE-BOMB run. In H.RES graphics
SUB ATTACK: It's April, 1943. The enemy convoy is headed for the CORAL SEA. Your sub, the MORAY, has just sighted the CARRIERS and BATTLESHIPS. Easy pickings. But watch out for the DESTROYERS - they're fast and deadly. In HI-RES graphics
FREE CATALOG—All programs are supplied in disc and run on Apple II w/Disc & Applesoft ROM Card & TRS-80 Level II and require 32K RAM unless otherwise noted. Detailed instructions included. Orders shipped within 3 days. Card users include card number. Add \$1.50 postage and handling with each order.
SPECTRUM SOFTWARE
DEALER INQUIRIES P.O. 80X 2084 - 142 CARLOW, SUNNYVALE, CA 94087 306 INVITED FOR PHONE ORDERS - 408-738-4387

# **OUR PRICES** ARE TOO LOW ADVERTISE!

800-243-7428

LOOK WHAT WE OFFER!

- **HAZELTINE Terminals**
- CENTRONICS **Printers**
- **LEAR-SIEGLER Terminals/Printers**
- DATAPRODUCTS **Printers**
- **ANNADEX Printers**

# **BE SMART-**UNTIL YOU CHECK OUR PRICES!

MASTERCHARGE VISA \_\_\_\_ COD PERSONAL CHECK **MONEY ORDER** 

RESEARCH & DEVELOPMENT, LTD. 333 Litchfield Rd., New Milford, CT 06776



# **6800 DEVELOPMENT PAC II**

- 6800 MICRO COMPUTER
- 48K RAM EROM PROGRAMMER
- RS-232 INTERFACE CASSETTE INTERFACE
- MONITOR DEBUG ROM
- EDITOR/ASSEMBLER
   4K INDUSTRIAL BASIC
- RACK, BACK PLANE, SUPPLY



WINTEK Corp. 163

317-742-8428 1801 South St., Lafayette, IN 47904

# 779 UPPER CASE/lower case "Conversion Kit I"

Expand the capabilities of your 779 line printer to include word processing!! Available to all Centronics 779/TRS 80 Printer I owners is the option of lower case and changing slash 0 Zero to standard 0. No etch cuts or soldering needed. Installs in minutes with a screwdriver. No program modification or additional interface is required. Price \$125.00

# Motor Control "CONVERSION KIT II" FOR ALL CENTRONICS 779/TRS 80 PRINTER I LINE PRINTERS!!

Our "Conversion Kit II" Motor Controller gives your 779 the ability to turn the motor on and off automatically. Removes the annoying noise of constant run, increasing the life span of your 779 / TRS 80 line printer motor! No soldering, software or hardware changes needed. Installs easily. **Price \$95.00** 

SAVE! Buy Service Technologies "Conversion Kit I" and "Conversion Kit II" together for the single price of \$199.00

Also available for the following Centronics printer: 700, 701, 702, 703, 780 and 781.

To order; please send check or money order in the proper amount to:



Service Technologies, Inc. 32 Nightingale Rd. Nashua, N.H. 03062 208 (603) 883-5369

Visa and Master Charge accepted (please include signature, expiration date and phone number).

Service Technologies will pay all shipping and handling

# MORE PROVEN CP/M AND NORTHSTAR SOFTWARE From the Software Review

SOFTWARE MUSIC SYNTHESIS SYSTEM-From Califroria Software, this superb four-voice music synthesizer proves that software can do anything that hardware can do and do it cheaper. Will run old Proc-Tech Music System songs. Available on Northstar Disk, CUTER cassette, and most CP/M formats, includes 10 songs.....\$79.95 (A/R, A/P, G/L, Payroll) is available on most CP/M formats. (A/R, A/P, G/L, Payroll) is available on most CP/M formats.
Documentation separate) \$100
CREATIVE COMPUTING'S ADVENTURE—The real thing!
Re-written for Northstar BASIC. Requires 48K system.
Specially licensed from Creative Computing for Software
Review customers. On Northstar Diskette \$29.95
FASTGAMMON—The definitive Backgammon game for
memory-mapped video systems. Machine coded for extreme speed, requires VDM or Flashwriter-type display.
Supplied on Northstar diskette, CUTER cassette and
CP/M disk. \$29.95
QUIK-REF—Machine coded cross-reference/branch trace for Northstar BASIC programs. Absolutely the best XREF available. Super fast \$21.50

SCAN—Specially licensed to the Software Review, this is the PALO ALTO TINY BASIC EXTENDED FOR NORTHSTAR-Completely I/O'd to Northstar DOS. Includes documented (and out of print) source code and instructions.....\$30.00

Software Review 704 Solano Avenue Albany, CA 94706 (415)527-7730



# Hardware Debug

The New Technologies Co. introduces their Hardware Debug Aid, an S100 board that offers the technician or hobbyist an inexpensive alternative to a logic analyzer when troubleshooting micro-computers. The HDA(S100) features the ability to provide a pulse to sync an oscilloscope on any specific instruction or portion of instruction. If the technician desires, the address buss may be disconnected so as to sync on any combination of up to 17 signals by using jumpers. The sync pulse also is used to latch and display on LED's the qualified status of up to 8 TTL level signals. Price is \$99.95.

# New Technologies Co.

P.O. Box 32 Streamwood, IL. 60103 Tel. (312) 289-4410

All About

BASIC-IN-ROM

Ohio Scientific Microsoft BASIC Ver 1.0 Rev 3.2 REFERENCE MANUAL

Complete, Concise, Accurate, Detailed. All commands, statements, and functions. Maps. USR. Tapes. Bug fixes. Variable tables. Source code storage. MONITOR.

Postpaid \$8.95 Send check, or COD

EDWARD H. CARLSON J 259 3872 RALEIGH DR. OKEMOS, MI 48864

Dealer Inquiries Welcome

# **Professional Business Software**

For The Commodore 32K Microcomputer System With 2040 Dual Drive Disk & 2022 Tractor Feed Printer









# General Ledger

- Holds Up To 300 Accounts.
- Accepts Up To 3000 Transactions Per Month.
- Cash Disbursements Journal, Cash Receipts Journal, and Petty Cash Journal for simplified data entry.
- Maintains Account Balances For Present Month, Present Quarter, Present Year, Three Previous Quarters, And Previous Year.
- Complete Financial Reports Including Trial Balance, Balance Sheet, Profit & Loss Statement, Cash Receipts Journal, Cash Disbursements Journal, Petty Cash Journal and more.
- Accepts Postings From External Sources Such As Accounts Payable, Accounts Receivable, Payroll, Etc. . . . . . . . . . . . \$295.00

# **Accounts Payable**

- Interactive Data Entry With Verified Input And Complete Operator Prompting.
- Automatic Application Of Credit And Debit Memos.
- Maintains Complete Purchase Records For Up To 200 Vendors.
- Invoice File Accepts Up To 400 Invoices.
- Random Access File Organization Allows Fast Individual Record Updating.
- Multiple Reports Provide A Complete Audit Trail.
- Check Printing With Full Invoice Detail.
- Full Invoice Aging.
- Automatic Posting To General Ledger ....\$195.00

# Accounts Receivable

- Maintains Invoice File For Up To 300 Invoices.
- Accomodates Full Or Partial Invoice Payments.
- Customer File Maintains Purchase Information For Up To 1000 Customers.
- Allows For Automatic Progress Billing.
- Provides For Credit And Debit Memos As Well As Invoices.
- Prints Individualized Customer Statements.
- Interactive Data Entry With FullOperator Prompting.
- Complete Data Input Verification And Formating.
- Automatic Posting To General Ledger ....\$195.00

# **Payroll**

- Maintains Monthly, Quarterly, And Yearly Cumulative Totals For Each Employee.
- Payroll Check Printing With Full Deduction And Pay Detail.
- Sixteen Different Reports Including W2 And 941.
- Interactive Data Entry With Easy Correction Of Entry Errors.
- Automatic Data Verification.
- Complete Job Costing Option With Cumulative Totals And Overhead Calculations.
- Random Access File Organization For Fast Updating Of Individual Records.
- Automatic Posting To General Ledger ... \$350.00

Structured around the time tested and reliability proven series of business software systems developed by Osborne and Associates, these programs have been designed to fill the need of a comprehensive accounting package for the new Commodore PET micro computer system. Each program can either stand alone, or be integrated with the others in a total software system.

Designed with the first time user in mind, these programs lead the operator through step by step, verified data entry. It is impossible to 'crash' a program due to operator error or invalid data input. Design consistency has been maintained from program to program to greatly increase operator familiarity and confidence.

Documentation, normally a problem for small systems users, is provided by the comprehensive series of Osborne

and Associates user manuals. These three manuals together total over 800 pages of detailed step by step instructions written at three levels for DP Department Managers, Data Entry Operators, and Programmers. You don't have to worry about getting 'promises' instead of documentation because the documentation was written before the programs were developed. A second set of manuals details any changes required during conversion. Each program provided on disk with complete documentation. Packaged in a handsome three ring binder with pockets and twelve monthly dividers for convenient storage of reports.

See your nearest Commodore dealer for a demonstration of this outstanding business software system.

CMS Software Systems

# Start/Exit Routine for CP/M

This assembly-language utility provides links between CP/M and user programs and permits simplified operation of remote terminals.

Ken Barbier Borrego Engineering PO Box 1253 Borrego Springs, CA 92004

f you program in assembly language under CP/M, you might find that Start/Exit routine in this article listing to be a useful addition to your program library. While basically written to provide orderly linkages between CP/M and user programs under console control, this program provides other convenient features, all in less than 256 bytes:

- It allows you to quickly copy .COM files from disk to disk, even if you have only a single disk drive.
- It provides an exit from CP/M to your built-in ROM monitor, or to other bootstrap programs in ROM.
- It provides a return to CP/M from user programs or from a ROM monitor.
- 4. By allowing you to jump between CP/M, user programs and the ROM monitor under console control, it permits the operation of remote terminals without the need for access to the computer's RESET switch or front panel.
- 5. It includes a console message output subroutine that permits you to embed console messages anywhere within your assembly-language programs, much like BASIC PRINT statements.

# The Start Program

The source program resides on disk as library file START.LIB and should be appended at the beginning of any assembly-language source program by entering the ED statement "RSTART." When thus used as a library file, line 79 should be replaced by "ORG 0200H", so that your user program will now start at location 200 instead of 100, where Start must reside at the beginning of the transient program area.

When your assembled user program (including Start) that is on the disk as a .COM file is called by name, CP/M will load your program and jump to Start, which will then display the following console message:

B = TAPE BOOTSTRAP

C = CP/M RESTART

M= MONITOR

R = RUN PROGRAM

?:

where ?: is prompting you for one of the four single-letter directive choices. If you enter the wrong letter, hit the Rubout key before a carriage return, and Start will reprompt with ?

When the correct choice is entered, followed by a carriage return, Start will jump to the desired program. If your choice is R to run your user program, then that program can return to Start at address 100 after it has done its thing, allowing you to make any of the four choices as before.

If you have a good monitor program in ROM, you might prefer to use it instead of CP/M's DDT to debug your new user program, so you would enter M instead of R. When finished with the monitor, it can reenter Start at location 100 to provide a link back to CP/M.

# The Exit Program

If you assemble this program with line 79 as an END statement as shown in the

listing and name the object file EXIT.COM, then this same routine can be used as an exit from CP/M to your monitor or a tape bootstrap program. This is especially useful if CP/M is a recent addition to your system, and you have mountains of software on cassette tapes.

I hope that when you ran those cables from the computer room to the bedroom (so you could play in comfort), you included a couple of audio cables so you could take your cassette along with you. Now you can easily switch between disk programs under CP/M and cassette programs at your remote terminal without having to get up to hit the reset switch.

# A Convenient Message Subroutine

Start/Exit includes a console message subroutine that allows you to place console messages anywhere within your program and output them to the console with a minimum of overhead. For example, you can output an error message with this simple sequence:

CALL MSGXP

DB 'ERROR!'

DB 0DH,0AH,0

Your message can be any length, and the length parameter does not have to be passed to MSGXP. Your message text must terminate in a zero, and the subroutine will return to your calling program at the state-

# Program listing. Start/Exit program in assembly language.

8:	3E09		CI	EQU	3E09H	;	BIOS 'CONIN'
9:	3 EØC	=	CO	EQU	3 EØCH	;	BIOS 'CONOUT'
10:	3EØ3	=	WBOOT	EQU	3EØ3H	;	WARM START
11:	2900	=	STAK	EQU	2900H	3	TOP OF USEABLE RAM
12:	C800	=	MONITOR	EQU	ØC800H	;	ROM MONITOR
13:	C8Ø3	=	TBOOT	EQU	<b>ØC8Ø3H</b>	;	ROM TAPE BOOTSTRAP
14:	0200	=	PROGRAM	EQU	0200H	;	PROGRAM START
15:							
16:	0100			ORG	0100H		; TPA START
17:							
18:	0100	310029	START	LXI	SP, STAK		; SETUP STACK
19:	0103	FB		EI			; ENABLE INTS
20:	0104	CD9101		CALL	MSGXP		; SIGN - ON
21:	0107	ØDØA		DB	ØDH, ØAH		; CR, LF
22:	0109	42203D2054		DB	'B = TAF	E	BOOTSTRAP'

23:	GIIB	ØDØA		DB	ØDH, ØAH					
		43203D2043	3	DB	'C = CP		RES	TART	,	
25:		ØDØA		DB	ØDH, ØAH		1123			
		4D203D204I		DB	'M = MO		TOP			
		0D0A		DB	ØDH. ØAH		IOR			
							2200			
		52203D2052		DB	'R = RU			RAM .		
29:	014B	ØDØAØØ		DB	ØDH, ØAH	96				
30:					The second second					
			STARØ		MSGXP			;	PROMP	T INPUT
		ØDØA		DB	ØDH, ØAH					
33:		3F3A20		DB	.31					
34:		00		DB	0					
35:									0.00	I DECETUE
		CD093E	STARI	CALL	CI			3	GET D	IRECTIVE
	Ø15A			PUSH	PSW			j	SAVE	1 1
	Ø15B			MOV	C.A			;	ECHO	11
39:	Ø15C	CDØC3E		CALL	CO					
40:	Ø15F	CDØ93E	STAR2	CALL	CI			3	WAIT	FOR CR
41:	0162			PUSH	PSW					
42:	0163	4F		MOV	C.A					
43:	0164	CDØC3E		CALL	CO					
	Ø167			POP	PSW					
45:	0168	FEØD		CPI	Ø DH			;	IS IN	PUT CR?
		CA75Ø1		JZ	STAR3					
	Ø16D			CPI	ØFFH			3	IS IT	RUBOUT?
		CA8DØ1		JZ	STAR4			;	YES,	RESTART
		C35FØ1		JMP	STAR2			;	GET N	EXT CHAR
		F1	STAR3		PSW			;	RESTO	RE CHAR
		FE42	5	CPI	•B•			;	PROCE	SS DIREC
		CAØ3C8		JZ	TBOOT					
		FE43		CPI	'C'					
		CA033E		JZ	WBOOT					
		FE4D		CPI	·M.					
		CAØØC8		JZ	MONITOR					
	0185			CPI	'R'					
		CA0002		JZ	PROGRAM					
		C34E01			STARØ				ILLEG.	AI I
		F1	STAR4	DOD	PSW				KILL	
61:		C34E01	SIARA	JMP	STARØ					EW ONE
62:		034E01		UMP	SIAND			,	OEI W	TW OIVE
63:			*							
64:				T MESSAG	F TO COM	SO	F			
65:				D RETURN		_				
66:			* *	D KEI UKN	IIIIO IIV	ستا ت				
671			-							
	Ø191	F1	MSGXP	POP	н		CET	CAL	L ADRS	. 1
69:			MSGXP MSGX1	MOV					RACTER	
	0192		MAGAI	CPI	0 A M					
71:		CAAØØ1			MSGEX		TIL	FIND	OF ME	SOAGE
72:	0198			JZ	MAGEA		CHA	N EA.	1	(0)
				MOV	C.M	,	CHA	MAUT	LK TU	(()
73:		CDØC3E		CALL					CHARAC	TER
74:	Ø19C			INX	Н					
		C39201		JMP	MSGX1	3	CON.	LINUI	ETIL	DONE
	Ø1AØ		MSGEX	INX	H				NEXT	
	ØIAI	E9		PCHL		;	INS	TRUC:	L (NOI	AND GO!
78:										
79:	Ø1A2			END						

ment immediately following the zero.

MSGXP uses the A, C and H, L registers, so if you need to preserve the contents of these registers, you will have to surround your CALL and the message text with appropriate PUSH and POP statements.

There is quite a bit of program space left between the top of Start and the beginning of user program space at location 200. You can use this room for additional jump options. Both the header message text and the directive processing in the program listing are organized to make it easy to add options.

In any case, it would be a good idea to leave the start address of all user programs at location 200, even if some space is wasted. Then you will always know where your program begins.

# Single Drive Disk Copy

With Start appended to your program, it is easy to copy that program onto another CP/M disk even with a single drive system. When Start prompts with ?: place the destination disk in the drive and enter C and a carriage return to reboot CP/M from the new disk. When CP/M prompts with "A>" enter "SAVE x X.COM", where X is your program name and x is the appropriate size in 256 byte blocks.

By rebooting CP/M, you enable writing onto the new disk. Your user program remains undisturbed in memory during the reboot, ready to be saved.

The absolute addresses in the EQUate statements are for a 16K version of CP/M. The addresses given for the monitor and tape bootstrap programs are for a specific hardware system, and you will have to change them to the proper entry points for your own ROM programs.

# Computing<sub>tm</sub>

# THE OTHER ALL 6800 **COMPUTER MAGAZINE**

Devoted to the 6800-6809 enthusiast...Software, fixes, hardware, reviews and more!

Charter Subscription \$12.00-1 Year \$22.00-2 Years VISA MC

FREE SAMPLE ISSUE (60¢ in stamps for 1st Class)

> SS-50 Computing 321 P.O. Box 402K Logan, Utah 84321

# 6800, 8080, 6502

# **PROGRAMMERS** and HARDWARE MOONLIGHTERS

Small, growing, established company (\$600K sales) needs experienced programmers and hardware people in the Manchester, N.H. area. You will aid our development of 6800 based "black boxes" that monitor industrial production/ manufacturing functions. You will interface these units to various mini/micro computers via RS232 and develop number crunching/display programs. Position(s) could evolve into full time (if desired) within 12-18 months. This is a unique opportunity for right individual.

Contact: Karl Ritzinger Industrial Marine Electronics Inc. 61 Harvey Road - RFD #10 Manchester, N.H. 03103 (603) 434-2309

# HIGH SPEED **16K MEMORY** \$48.00

Set of 8 4116 RAM chips, for use in Apple, Heath, Pet or TRS-80. Add \$3.00 for shipping & handling (CA residents add 6% sales tax).

Visa, Mastercharge orders 800-538-8559 (outside CA).

exatron >57

181 Commercial Street Sunnyvale, CA 94086

408-737-7111

# Modifying the Horizon Double Density DOS

# Programming tricks to really personalize your system.

George L. Haller 1500 Galleon Drive Naples, FL 33940

The Horizon disk operating system for double density is a wonderful collection of instructions. But it lacks some of the personalized features that would make it even better.

# The Modifications

There are three modifications I think can improve the system.

- 1. On many occasions, I would like to have the video display and the printer work at the same time without modifying the BA-SIC program. Since the first serial output is for the video terminal and the second serial output is available for a peripheral, all I need is to make them work together in tandem. I then will have the video displaying the output while the output is also being printed.
- 2. I would like the ability to output the desired number of nulls. Some peripherals in the serial mode require a certain number of nulls after CR/LF. This feature was included as a command in the older North Star BASIC, but was eliminated some versions ago.
- 3. I would like to be able to output spaces after a CR/LF. This feature is useful when a line printer prints too close to the left-hand edge of the paper and does not leave enough space for binding the pages. It is especially convenient for listing where you do not have control of the page format.

The first modification is simple because

of the output code setup. The first serial output is a subroutine starting at 293EH with a Return, C9H, at 2948H. This is followed by the second serial output at 2949H with a Return at 2953H. All you need to link the two outputs is to replace the first Return with a NOP, and you will be able to watch the video while the printer is working away.

This is easily done in BASIC by Fill 10568,0. To return to normal operation use Fill 10568,201. 201 is the decimal equivalent of C9H, which is Return. This is shown in Listing 1.

The second modification, to add nulls, is more difficult, since you must key on the CR/LF to determine when to add the nulls. Actually, you key on the line-feed character. Listing 2 shows the necessary changes.

There is adequate space beginning at 29BCH to accommodate your new sub program so that at COUT1, 2949H, you will jump to the patch named COUT3 with C3,BC,29.

The remainder of the codes in COUT1 are not used. The codes shown in Listing 1 are inserted and used. This particular set inserts seven nulls, but this number may be changed at 29CCH.

The third modification, the insertion of spaces at the beginning of each line, can be assembled similarly. Listing 3 shows a combination of both nulls and spaces, with seven nulls and five spaces.

These programs are versatile, and if residing in DOS, may be changed by the BASIC FILL command.

\$THE FOLLOWING IS A PATCH IN USER'S AREA OF N\*
#HORIZON DOUBLE DENSITY DOS TO ALLOW THE
#OUTPUT ON TERMINAL 1 AND TERMINAL 2 IN
#TANDEM AND CONTINUOUSLY. THIS PATCH IS
#IS MERELY CHANGING 2948 FROM C9 TO NOP.
#THIS CAN BE DONE IN BASIC BY FILL 10568, O
### AND RETURNED TO NORMAL BY FILL 10568, 201

293E	DBO3	COUO	IN	3	INPUT FIRST SERIAL PORT STATUS
2940	E601		ANI	1	*MASK OUTPUT STATUS BIT
2942	CA3E29		JZ	COUO	*LOOP IF NOT READY TO OUTPUT
2945	78		VOM	A.B	*MOVE CHARACTER TO A
2946	D302		OUT	2	OUTPUT THE CHARACTER
2948	C9		RET		CHANGE TO NOP TO OUTPUT
					TO BOTH SERIAL PORTS
2949	DB05	COUTI	IN	5	INPUT SECOND SERIAL PORT STATUS
294B	E601		ANI	1	MASK INPUT STATUS BIT
294D	CA4929		JZ	COUTI	*LOOP IF NOT READY TO OUTPUT
2950	78		VOM	A.B	*MOVE CHARACTER TO A
2951	D304		OUT	4	SOUTPUT THE CHARACTER
2953	C9		RET		

Listing 1. Modification to link two outputs.

10 Input "DEVICE NUMBER",Z 20 PRINT #Z, "THIS WILL PRINT ON THE SELECTED DEVICE'

30 PRINT "THIS WILL PRINT ON THE VIDEO TER-MINAL"

Table 1.

If only the null change is made as shown in Listing 2, any number of nulls may be inserted in the DOS by FILL 10700,XX, where XX is the number of desired nulls in decimal, 10700D = 29CCH.

If the null and space version (Listing 3) is in use, then FILL 10700,XX will insert XX nulls and FILL 10714,YY will insert YY spaces.

# Implementation

Bring up your DOS and load it at 4000H by LF 4000. Then go to the monitor at 0 or 2D00H. The monitor should be loaded where it will not interfere with the operating DOS or the loaded DOS. The loaded DOS uses 4000H to 4CFFH. The modifications may be inserted into the loaded DOS by using the FM or the DS command from the monitor. But, while the code will end up in the 2900s, it should be loaded into the 4800s instead of the 4900s.

In other words, the first three codes inserted would start at 4848H and would be C3.BC.29, and the next inserted codes would start at 48BCH and be 78,FE,0A. When you have made the modifications, use the monitor command OS to get back to the operating DOS and then SF DOS 4000, which will save your new DOS and let you try it.

\*THE FOLLOWING IS A PATCH IN USER'S AREA OF N\*
\*HORIZON DOUBLE DENSITY DOS TO INSERT NULLS AND
\*SPACES AFTER A CR/LF. THIS PATCH IS JUMPED TO BY THE
\*SMALL PATCH FROM THE BEGINNING OF COUT! AT 2949H. 101/10/80

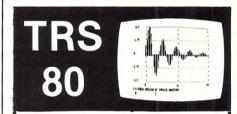
		COUT3	MOV CPI JZ JMP	A,B OAH LNFD OUTPT	*PUT CHAR IN REG A *IS IT A LF? *YES *NO
	CDE829	LNFD	CALL PUSH	OUTPT	SOUTPUT THE LF CHAR.
	0E07		MVI	B,0 C,7	NULL CHAR. TO B REG.
29CD	OD	NULLS	DCR	C	DECR. C REG.
29CE	FAD729 CDE829		JM	SPACE	FIF ALL DONE W/NULLS
	C3CD29		CALL JMP	OUTPT	OUTPUT A NULL DO IT AGAIN
29D7	0620	SPACE	MVI	C.5	SPACE CHAR. TO B REG.
	0E05		MVI	C,5	NO. OF SPACES TO C
		SPACE I	DCR	C	DECR. C REG.
	FAE529		JM	POP I	FIF ALL DONE WITH SPACES
	CDE829 C3DB29		CALL JMP	SPACEI	DO IT AGAIN
29E5		POPI	POP	В	*RESTORE C
29E6			MOV	A, B	*MAKE A=B
29E7			RET	_	
		OUTPT	IN	5	FOLLOWING IS A COPY
29EA 29EC	CAE829		ANI JZ	OUTPT	OF THE COUT! CODE
	78		MOV	A, B	
			OUT	4	
29F2	C9		RET		

Listing 3. Modification to insert spaces at the beginning of each line.

One other trick in manipulating the output to the various terminals is to use the output device capability of North Star BASIC. You can put a line in the BASIC program requesting the input of the output device number, and then use it as needed in the program. While this is described in the manual, the short program in Table 1 may give one an idea of how it works.

2949 C3BC29

This comes in handy when only part of the output is to be printed and the remainder goes to the video terminal.



- F(ast) F(ourier) T(ransform)
- Digital Filter Simulation
- Linear and Exponential Curve Fit
- Disk or Cassette Data & Results Files
- Interactive Graphics
- Having this set of interactive programs in your hands is a learning experience in digital signal processing.
- ■Learn by doing. Documentation includes multiple examples. Balance your checkbook with a digital filter (can you believe it?). Plot daily stock market values and their computed trend lines. Find the frequency response of a digital filter. Illustrate Nyquist sampling theorem. Perform spectral analysis on any waveform (FFT).
- This sophisticated software, written by a professor and consultant in the digital processing field for use in teaching and research, is written in basic for ease of user understanding and modification. Runs in a minimum 16K cassette system having expanded capabilities when used with disk and printer systems.

FFT-80 DISK \$30.00 FFT-80 CASSETTE \$25.00



P.O. Box 1181 Goleta, CA 93017

\*THE FOLLOWING IS A PATCH IN USER'S AREA OF N\*
\*HORIZON DOUBLE DENSITY DOS TO INSERT NULLS AFTER
\*A CR/LF. THIS PATCH IS JUMPED TO BY THE SMALL PATCH FROM THE BEGINNING OF COUT! AT 294 9H. 101/10/80

2949	C3BC29				
29BC	78	COUT3	MOV	A,B	PUT CHAR IN REG A
29BD	FEOA		CPI	OAH	IS IT A LF?
29BF			JZ	LNFD	IYES
29C2		Name and Address of the Address of t	JMP	OUTPT	\$NO
29C5 29C8		LNFD	PUSH	OUTPT	SAVE C
29C9	06.00		MVI	B, 0	NULL CHAR TO B REG.
29CB	0E07		MVI	C.7	\$7 NULLS TO C REG.
29CD	OD	NULLS	DCR	C	DEC. C REG.
29CE	FAD729		ML	POP I	FRESTORE C
29D1	CDDA29		CALL	OUTPT	SOUTPUT A NULL
29D4	C3CD29		JMP	NULLS	DO IT AGAIN
29D7	CI	POPI	POP	C	*RESTORE C
29D8	78		MOV	A.B	MOVE B TO A
29D9	C9		RET		Later to the second
29DA	DB05	OUTPUT	IN	5	*FOLLOWING IS A COPY
29DC	E601		ANI	1	FOF THE COUT! CODE
29DE	CADA29		JZ	OUTPT	
29E1	78		MOV	A,B	1
29E2	D304		OUT	4	1
29E4	C9		RET		•

# **16K MEMORY KITS** TMS-4116 N.S.

FOR: APPLE, TRS-80, HEATH **EXPANDORAM I & II AND MANY** MORE

12 MONTH GUARANTEE

PER SET \$48.00 OF 8 CHIPS

ADD \$2.00 SHIPPING & HANDLING PER ORDER

omouter

ervices

30 Hwy. 321, N.W. P. O. Box 2292 Hickory, N. C. 28601 (704) 294-1616 PAYMENT: MASTER CHARGE, VISA

MASTER CHARGE, VISA CASH, MONEY ORDER, U.P.S., C.O.D., PERSONAL CHECKS REQUIRE 2-3 WKS. TO CLEAR BANK.

**PHONE HOURS:** 

6 P.M. - 9 P.M. EST



Solve your disk problems, buy 100% surface tested Dysan diskettes. All orders shipped from stock, within 24 hours. Call toll FREE (800) 235-4137 for prices and information. Visa and Master Card accepted. All orders sent postage paid.

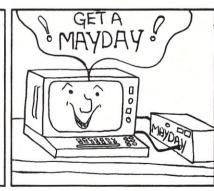


# MAYDAY

The Complete Uninterruptable Power Supply







The lights blinked even the slightest power failure

can ruin a data disk and cause loss of the program.

Protect your time and investment -

easy to use just plug your computer into

MAYDAY."



for more information contact ...

Sun - Technology, Inc. Box 210

New Durham, New Hampshire 03855 (603) 859-7110 V 152

We honor:





(Manufacturing high technology products since 1970)

# DR. DALEY'S BEST Mailing List Is Now Better!

DR. DALEY has taken his best selling mailing list and made it even better! This version has been totally revised to increase the reliability of the files and make it even easier to operate. Several new features have been added:

- Goof-proof input routine. Eliminates the irritating results of accidentally pressing some cursor control keys. This is a machine code routine so it is as fast as you are! BONUS—Auto repeat on all keys!
- Interface to allow output of the entire mailing list or virtually ANY subset to WORD-PRO III and WORDPRO IV format files so you can use these to generate personalized form letters. YOU can format the structure of this output!
- Routines to merge files and to minimize the number of duplicate entries in a file.
- More machine code routines to speed up processing.
- In addition you have the same powerful file formatting options where YOU can determine the structure of the files. YOU can format your label output with up to 11 lines per label and from 1 to 8 (yes EIGHT) labels per line.

This system is completely menu driven. It includes 100 pages of user documentation. This documentation is for the end user and is not padded with listings, flow charts, and other such extraneous material.

This program will be available for a short time at the introductory price of \$159.95. It is available for the 32K PET and CBM 2000, 3000 and 8000 series computers. You can order through your dealer or directly from us. We will accept VISA or MASTERCARD or your check or money order. Overseas orders include 10% to cover shipping.

> Charge to your MC/VISA





# DR. DALEY'S Software -34

425 Grove Avenue, Berrien Springs, MI 49103 Phone (616) 471-5514 Sunday - Thursday noon to 9 p.m., Eastern Time

# **PET Mini Monitor**

# This short routine hides in the second cassette buffer and makes creating and saving machine-language programs a snap.

William H. Perdue 2815 Pulaski Pike Huntsville, AL 35810

f you have ever tried any real-time graphics on your PET, you have undoubtedly found that BASIC is sometimes too slow. Normally, the answer is to use machine-language subroutines that can be linked to your main BASIC program through the SYS command.

However, entering the machine code for the subroutine into the machine is a clumsy and time-consuming operation, even though this can be done using BASIC. Everything must be converted from hexadecimal to decimal and then poked into the proper memory locations. Another drawback occurs when you have to locate and correct errors, or make changes, in your machine-language routines. Again, it is possible to do this using BASIC, but not very effi-

Another drawback becomes apparent after you get your program written, entered into the machine, with everything working correctly together, and then you try to save it on tape. The normal SAVE operation will only save the program that is written in BASIC, and the machine-language routines are ignored. The only way around this is to rewrite the entire program, putting the machine code into DATA statements and including a routine to read and poke the data into the necessary memory locations. Although this will now allow you to save the complete program in BASIC, it does use up

a considerable amount of memory.

You can deal with all of these drawbacks using BASIC, although inconveniently, but there is a better way. This article describes a machine-language monitor program that allows you to read and write memory directly in hexadecimal form. This eliminates the need to convert from hexadecimal to decimal for entry, thereby reducing the possibility of errors. You can write, enter and check your programs in hex, which simplifies the task of machine-language programming. Most important is the ability to save the program once you have it written and checked out.

Machine-language monitor programs are not new; there is an excellent monitor program available for the PET that does all of the things I have covered and more. However, the program did not meet my particular needs. It required about 875 bytes of user RAM, which I was not willing to give up just for the convenience of writing machinelanguage code.

I needed a short and simple program that would do the job without using my BASIC text memory. Since I don't have a second cassette unit on my PET, I have 198 bytes of memory available at the end of page two of memory. With this in mind, I developed the PET Mini Monitor.

# **Program Description**

Mini Monitor is a machine-language program that resides in the second tape buffer. Operation of the program is similar to the KIM operating system. The program allows the user to open and display all memory addresses, modify data in RAM-type memory and save programs on tape from any point in memory. The program does not affect the normal BASIC interpreter operating sys-

tem. This allows the user to access oneeither the Mini Monitor or the BASIC interpreter operating system-without having any detrimental effect on the other.

### Instructions

First, you must enter the program into your machine. If you have the PET TIM program, you can use it to enter the machine code from the listing; otherwise, use the BASIC program in Listing 1. Carefully type in the program and check the DATA statements to be sure you have made no mistakes before you run the program. Once you have run the BASIC program and have the machine code in the machine, the normal READY indication should display on your screen.

If you have a new PET or have installed the new ROM set in your machine, do not try to run Mini Monitor. The zero-page allocation is different in the new operating system, and the program can cause you to lose your operating system. If you have one of the old PETs and have the normal READY indication after loading the machine code. you can run the program. You must type SYS(826) and press the return key. This will link in the machine-language program and produce the following display:

0400 00 ()--- Blinking cursor

This start display should appear every time you enter the program. The MM indicates that you are running Mini Monitor and have successfully entered the program. The four-digit number is the hexadecimal memory address, which is followed by a twodigit number that shows the hexadecimal contents of the memory cell. The actual value of the two-digit number will depend on the contents of memory at the time of dis-

```
4C entered into address 0401
0401 00
        4C
0402 00
         43A
               3A entered into address 0402
0403 00
         3
               03 entered into address 0403
0404 00
         0
               00 entered into address 0404
*Note: The actual value displayed in this column will depend on the contents of
memory at the time of the display and may not be the values shown.
                                  Table 1.
                         new address entered and RETURN pressed
 F6B1 A5
            ()--- Blinking cursor
                                 new address displayed
 F6B1 A5
            F1:
                        new address 00F1 (leading zeros assumed)
            ()--- Blinking cursor
 00F1 01
            F6033A:
                        new address 033A (four characters preceding the colon)
 033A D8 ()--- Blinking cursor
 033A D8
                        return to start
                                                                Address
 0400
       00 ()--- Blinking cursor
                                                                00E5
```

play. To open and display the next sequential memory cell, just press the RETURN key. Your display should now appear as follows:

Table 2.

MM 0400 00 0401 00 ()--- Blinking cursor

To change the data in a memory address, type the new hexadecimal data and press the return key. The program will enter the data in the last open address and then open and display the next sequential memory address. Only the last two numbers typed before the return key will be entered into memory. If only one number is typed before the return key, the most significant digit of the data is automatically assumed to be zero. Table 1 shows some examples of how to change data in a memory address.

If you want to check if the correct value was entered into memory, type † (up arrow) and press the return key. This will cause the program to open and display the previous memory cell. Repeating the operation will again cause the next previous memory cell to be displayed. You can continue in this manner as long as you wish, going backward through memory. With the examples in Table 1, the display is as follows:

0405 00 † 0404 00 † 0403 03 † 0402 3A † 0401 4C ()-- Blinking cursor

The Mini Monitor program automatically starts to open and display memory at hexadecimal address 0400 and continues sequentially after that. To change the address to be displayed next, type the hexadecimal address you wish to display, then type: (colon) and press the RETURN key. The new address followed by its contents will then be displayed. Pressing the return key will cause the next sequential address follow-

04 00 05 3A Endina Starting Address Address Hi Lo SYS(826) RETURN pressed (enter Mini Monitor program) MM 0400 XX\* E5: first address to be inspected (address 00E5) 00F5 XX 3A enter ending address Lo byte 00E6 XX 05 enter ending address Hi byte 00E7 XX next address to be inspected (address 00F1) F1: 00F1 XX 01 enter 01 always (01 = Tape #1) next address to be inspected (address 00F7) 00F2 XX F7: 00F7 XX 00 enter starting address Lo byte 00F8 XX 04 enter starting address Hi byte 00F9 XX 20 always enter 20 at this address 00FA XX always enter 00 at this address \*Note: The XX represents the contents of the address before modification.

Table 3.

```
00E5 enter FF

00E6 enter 03

00F1 enter 01

00F7 enter 3A

00F8 enter 03

00F9 enter 20

00FA enter 00
```

Type S and press RETURN
Type MINI MONITOR and press RETURN

Table 4.

ing the new address to be opened and displayed.

Only the last four characters preceding the colon will be used to establish the new address. If there are less than four characters preceding the colon, leading zeros are automatically assumed for the new address. If there are no characters preceding the colon, the program automatically returns to the start and displays address 0400. Examples of how to change the address being displayed are shown in Table 2.

When you want to return to the BASIC interpreter operating system, type X and press the return key. You should then see the familiar READY display. If not, you must turn off the power to reset the machine.

MM 0400 00 X exit to BASIC READY. ()--- Blinking cursor

The Mini Monitor program allows you to name and save programs from any point in memory. However, due to the save routine utilized, certain addresses must be set to specific values to assure correct save operation. Furthermore, you must know the hexadecimal starting and ending addresses of the program you want to save. The Mini Monitor program may be used to inspect the specified addresses and modify the data as needed. These modifications must be made prior to executing the save. Table 3 lists the steps necessary to save a program that has a starting address of 0400 and an ending address of 053A. Using the Mini Monitor, you would inspect and modify

```
10 FOR AD=826 TO 1023
20 READ D$
30 L=ASC(LEFT$(D$,1))
4Ø R=ASC(RIGHT$(D$,1))
5Ø IF L>64 THEN L=L-7
6Ø L=(L-48)*16
70 IF R>64 THEN R=R-7
80D=L+(R-48)
90 POKE AD, D
100 NEXT AD: END
11Ø DATA D8,2Ø,36,E2,A9,4D,2Ø,A7,Ø3,AØ,ØØ,A9,Ø4,85,5C,2Ø
120 DATA D2,C9,A5,5C,20,AD,03,98,20,AD,03,20,A5,03,B1,5B
13Ø DATA 2Ø,AD,Ø3,2Ø,E6,Ø3,EØ,ØØ,FØ,2F,B5,1F,C9,5E,DØ,ØA
14ø DATA 88,CØ,FF,DØ,DA,C6,5C,4C,49,Ø3,C9,3A,DØ,ØE,CA,8A
15Ø DATA FØ, BE, 2Ø, C6, Ø3, A8, 2Ø, C3, Ø3, 4C, 47, Ø3, C9, 58, FØ, 5B
16Ø DATA C9,53,FØ,ØD,2Ø,C6,Ø3,91,5B,C8,DØ,B3,E6,5C,4C,49
17Ø DATA Ø3,2Ø,E6,Ø3,86,EE,A2,ØØ,4C,B1,F6,A9,2Ø,2Ø,D2,FF
18Ø DATA 4C,D2,FF,48,4A,4A,4A,4A,2Ø,B8,Ø3,68,29,ØF,18,C9
19¢ DATA ØA,9¢,02,69,06,69,3¢,D¢,E7,8A,F¢,12,2¢,D9,03,E¢
200 DATA 00,F0,0B,85,FE,20,D9,03,0A,0A,0A,0A,05,FE,60,CA
21Ø DATA B5,2Ø,18,C9,41,9Ø,Ø2,69,Ø8,29,ØF,6Ø,A2,ØØ,2Ø,A5
22Ø DATA Ø3,2Ø,CF,FF,C9,ØD,FØ,F3,EØ,1Ø,FØ,F5,95,2Ø,E8,DØ
23Ø DATA FØ,ØØ,ØØ,ØØ,ØØ,ØØ
                   Listing 1. BASIC program.
```

oc.	Code		Label	Symbolic	Ø3D3	ØA				AS			
33A	D8		START	CLD	Ø3D4 Ø3D5	ØA ØA				AS AS			
3B	20 36	E2		JSR CLSCR	Ø3D6	Ø5	FE				A LN	TR	
3E	A9 4D			LDA #'M	Ø3D8	6ø	LL		BYRDY	RI		TD	
4ø	2Ø A7	ØЗ		JSR WRTW	Ø3D9	Op			i :	IV.			
43	AØ ØØ			LDY #ØØ	Ø3D9	CA			NIB	DE	X		
45	A9 Ø4			LDA #Ø4	Ø3DA	B5	2Ø				A BU	F,X	
47	85 5C	an	INAD	STA ADRH	Ø3DC	18				CI	C		
49 4C	2Ø D2	C9	DISP	JSR CRLF	Ø3DD	C9	41			CM	IP #\$	41	
4E	A5 5C 2Ø AD	Ø3		LDA ADRH JSR WRBY	Ø3DF	9Ø	Ø2				C HE		
51	98	V3		TYA	Ø3E1	69	Ø8				C #Ø		
52	2Ø AD	Ø3		JSR WRBY	Ø3E3	29	ØF		HEX		D #\$	ØF	
55	2Ø A5	Ø3		JSR SPTW	Ø3E5	6ø			EXIT	RI	S		
58	B1 5B			LDA (ADRL),Y	Ø3E6 Ø3E6	A2	øø		; INPUT	T.F	X #Ø	d	
5A	2Ø AD	Ø3		JSR WRBY	Ø3E8	20		Ø3	IMPOI		R SP		
5D	2Ø E6	Ø3		JSR INPUT	Ø3EB	20		FF	RDON		R RD		
6ø	EØ ØØ		CKINS	CPX #ØØ	Ø3EE	C9	ØD		112011		IP #\$		
62 64	FØ 2F			BEQ OPEN	Ø3FØ	FØ	F3				Q EX		
66	B5 1F C9 5E			LDA BUF-1,X CMP #'4	Ø3F2	ΕØ	1Ø			CF	X #\$	1Ø	
68	DØ ØA			BNE CKCOL	Ø3F4	FØ	F5			BE	Q RD	ON	
6A	88 88			DEY	Ø3F6	95	2Ø				'A BU	F,X	
6B	CØ FF			CPY #\$FF	Ø3F8	E8	-			IN		011	
6D	DØ DA			BNE DISP	Ø3F9	DØ	FØ				E RD		
6F	c6 5c			DEC ADRH	Ø3F <b>B</b> Ø3FC						t us		
71	4c 49	ØЗ	WARR	JMP DISP	Ø3FC Ø3FD						t us		
74	C9 3A		CKCOL	CMP #':	Ø3FE			4 1000	;		t us		
76	DØ ØE			BNE CKX	Ø3FF				;		t us		
78	CA			DEX	, , , ,				,				
79 7A	8a fø be			TXA BEO START	A 3 3 3	.,		4 - 0 -	1-1-7	1			
7C	2Ø C6	ø3		BEQ START JSR PKBY	Alphabe	tica	I lis	t of	_abel	rocatio	ns		
7F	A8	27		TAY	Label		Logo	tion		To	abel		Location
8ø	2Ø C3	Ø3		JSR CKBY									Location
83	4C 47			JMP INAD	ADRH		ØØ50			NI			Ø3D9
86	c9 58	a light	CKX	CMP #'X	ADRL		ØØ5B				EN		Ø393
88	FØ 5B			BEQ EXIT	ASC		Ø3BF				BY		Ø3C6
8A	C9 53			CMP #'S	BUF BYRDY		ØØ2Ø Ø3D8			RI RI	OON		Ø3EB FFCF
8C	FØ ØD	da		BEQ SAVR	CKBY		Ø3C3				VE VI		F6B1
8E	2Ø C6 91 5B	Ø3		JSR PKBY	CKCOL		Ø374				VIT		Ø39E
91 93	91 5B c8		OPEN	STA (ADRL),Y	CKINS		Ø36Ø				VR		Ø39B
194	DØ B3		OT TIM	BNE DISP	CKX		Ø386	5			WT		Ø3A5
396	E6 5C			INC ADRH	CRLF		C9D2				ART		Ø33A
398	4C 49	Ø3		JMP DISP	DISP		Ø349				RASC		Ø3B8
19B	2Ø E6		SAVR	JSR INPUT	EXIT		Ø3E5				RBY		Ø3AD
9E	86 EE		SAVIT	STX FNLEN	FNLEN		ØØEE				RON		Ø3AA
AØ	A2 ØØ	T/		LDX #ØØ	HEX INAD		Ø3E3 Ø347			WF WF	K.T.		FFD2 Ø3A7
A2	4C B1	F6		JMP SAVE	INPUT		Ø3E6			WI	. T. W		ואנא
A5	A9 2Ø		; SPTW	Subroutines follow LDA #\$20	LNIB		ØØFE						
A7	2Ø D2	FF	WRTW	JSR WRT									
AA	4C D2	FF	WRON	JMP WRT	Zero Pa	ge 1	ocati	ons us	sed				
AD			;		1000				1975				
AD	48		WRBY	PHA	Locatio	n		Labe:	1_	Remark	S		
AE	4A			LSR	øø2ø to	002	F	BUF		Input	buff	er fo	or commands and
AF	4A			LSR	ØØ5B			ADRL		Addres	s Lo	byte	File Name
BØ B1	4A			LSR	ØØ5C			ADRH		Addres			9
B1	4A	do		LSR WASA	ØØE5			EADL					Lo byte for SAVE
B2 B5	2Ø B8	ØЗ		JSR WRASC PLA	ØØE6			EADH					Hi byte for SAVE
B6	29 ØF			AND #\$ØF	ØØEE			FNLE	N				th for SAVE
B8	18		WRASC	CLC # \$\psi \chi	ØØF1			DN					or SAVE
B9	C9 ØA			CMP #\$ØA	øøf7 øøf8			SADL			_		s Lo byte for SAVE
BB	9ø ø2			BCC ASC	øøro øør9			FNAD					ss Hi byte for SAVE ess Lo byte for SAVE
BD	69 Ø6			ADC #Ø6	ØØFA			FNADI					ess Hi byte for SAVE
BF	69 3ø		ASC	ADC #\$3Ø	ØØFE			LNIB					in PKBY subroutine
Cl	DØ E7			BNE WRON				137					
C3	8A		CVDV	mv A	PET Ope	rati	ng Sy	stem	calls	used			
C3 C4	8A FØ 12		CKBY	TXA BEO BYDDY									
C4 C6	FØ 12 2Ø D9	Ø3	PKBY	BEQ BYRDY	Label			Loca	tion				
C9	EØ ØØ	CA	TVDI	JSR NIB CPX #ØØ	CLSCR			E236					
U)	FØ ØB			BEQ BYRDY	CRLF			C9D2					
CB				STA LNIB	SAVE			F6B1					
	85 H.H.			- man meri dider									
BCB BCD BCF	85 FE 2Ø D9	ØЗ		JSR NIB	RDT			FFCF					

Listing 2. PET machine-language Mini Monitor program.

the addresses as necessary. Once these modifications are made, type S and press the return key. The display should then look like this:

00FB XX S ()--- Blinking cursor

You may now type the name of the program. Up to 16 characters are allowed for the program name, and quotes are not necessary. After you finish typing the name, press the return key. You should then see this message displayed:

PRESS PLAY & RECORD ON TAPE #1

When the save routine in finished, the tape will stop and the program will exit to the BASIC interpreter operating system to give you the familiar READY display. Programs saved on tape by Mini Monitor can be loaded or verified in the same way as programs recorded by BASIC. When saving programs with Mini Monitor, make sure that the starting address you enter is less than the ending address, because the program does not check this. Otherwise, it will be necessary to execute a power-off reset of the machine and your program will be lost. To save the Mini Monitor on tape, enter the values in Table 4 into the indicated addresses

Once you have Mini Monitor on tape, you can load it whenever you need to. The program is loaded from tape by typing LOAD To avoid errors, use the following guide whenever you want to save a program using Mini Monitor:

### **Address**

00E5	Enter ending address Lo byte
00E6	Enter ending address Hi byte
00F1	Enter 01
00F7	Enter starting address Lo byte
00F8	Enter starting address Hi byte
00F9	Enter 20
00FA	Enter 00
Type S and	d press RETURN

Type program name and press RETURN

and pressing the return key, and then pressing the PLAY on tape #1. In a few seconds, you should see this display:

FOUND MINI MONITOR

The program should only take a few seconds to load before the normal READY indication appears. Now type NEW and press the return key to reset the BASIC operating system pointers after the load operation. You may now enter BASIC programs as usual or use Mini Monitor.

If you already have a BASIC program in your machine that you would not want to lose by typing NEW, and want to load Mini

Monitor, you must first type ?PEEK(124), PEEK(125) and press the return key. Write down the values and their respective locations, then load Mini Monitor in the normal manner. After the load is finished, type POKE 124,X:POKE 125,Y, where X and Y are the values you wrote down for their respective locations, and press the return key. Your program is now preserved, and Mini Monitor is ready for use.

Listing 2 is the machine-language program listing and includes an alphabetical list of label locations, zero-page locations used and the PET operating system calls used in the program.

**USED FANS** 

2522 BUTLER ST 214-630-4621

WE HAVE FLAT-PACK

**ACOUSTIC** 

# RONDURE COMPANY DALLAS, TEXAS 75235 the computer room

# SPECIAL Printer for your Microcomputer

# المتناشية

# **GE TERMINET** 300 PRINTER

Pin feed-9" paper

- 80 Print positions
- Receive only
- ASCII code RS-232 interface
- 30 CPS
- Upper & lowercase
- Shipping wt. 75#
   Shipping containers \$15.00.

(used) (good working condition)

Will run on serial RS232 port of most micros including TRS-80.

\$450.00



NEW **POWER** SUPPLY \$25.00

Modem

pickup

\$1950

5V at 3 Amp 12V at 6 Amp -12V at 3 Amp



USED **POWER** SUPPLY \$15.00

Muffin - 8.00

Sprite - 4.00

5V at 12 Amp 16V at 6 Amp 6V at 2 Amp



# NEW POWER SUPPLY

(AC-DC Brand)

Model 1-22V @ 1.9a \$20.00 Model 2-15V @ 2.4a \$30.00

# MICRO SWITCH KEYBOARD USED BUT LOOKS VERY NICE



ASC II

\$40.00 (With Print)



USED OMNITEK

> MODEM ORIGINATE TESTED

\$90.00 Sale

ORDERING INFORMATION:

We ship the ame day we receive a certified check or money order. Texas residents add 5% sales tax. Write for our CATALOG of many parts, terminals, printers, etc. All items subject to availability. Your money returned if we are out of stock. Mail order hours 9-4 Monday-Thursday. Closed Fridays.

SHIPPING INFORMATION:
Modems: \$3.00 each; Key Boards \$4.00, Power Supply \$7.00.
Large Items & Parts: Specify Freight or Air Freight Collect.
Foreign Orders: Add appropriate freight or postage.
We now take Master Charge and Visa orders. Specify full number, bank number and expiration date.

# Easy-to-Build Computer-Controlled Triac Dimmer

# This hardware/software article presents this project in the right light.

You can control the intensity of highwattage lamps or the speed of universal ac motors with your computer by adopting the circuitry and software in this article. The dimmer works through conventional phase-control techniques and, because of a simple sensing circuit, even adjusts to variations in line voltage.

Design features include an optically isolated gating circuit that helps protect your favorite piece of hardware from destructive ground loops or other disasters. Power capacity is determined primarily by triac selection. Most triacs work well when attached to an acceptable heat sink and provided with adequate ventilation. With a 40 ampere triac and convection cooling, the unit comfortably drives a 200 watt load.

Besides controlling such high-current loads this dimmer is also a voltage-controlled device. This means that remote-control applications can be accomplished with minimal external wiring. Interfacing is accomplished through a digital-to-analog converter (DAC), which transmits a 0 to 5 volt do signal to the dimmer's control card. Final ac output is a function of this signal, though not necessarily a linear one.

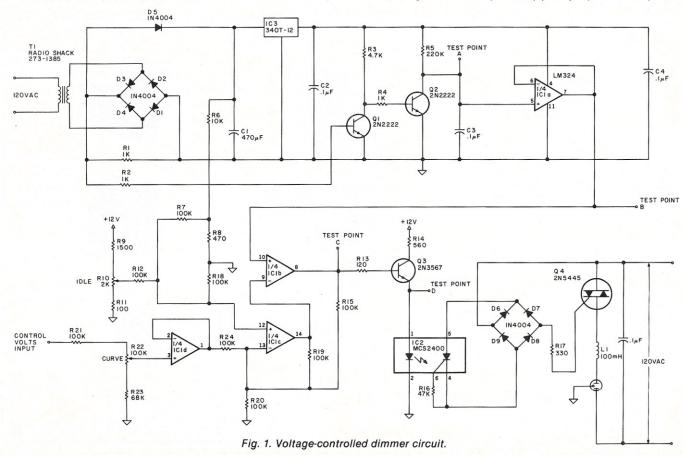
# **Circuit Description**

Before constructing the dimmer, you should understand how the circuit works. The schematic in Fig. 1 shows a small isolation transformer coupled to a full-wave bridge formed by diodes D1, D2, D3 and D4. The unfiltered output from this bridge acts

as a gating signal for the zero-crossing detector created by Q1. Whenever the output from the bridge approaches a zero potential, Q1 produces a narrow and positive pulse, which is inverted by Q2. One-hundred and twenty such pulses occur every second.

This pulse chain continually resets the ramp signal generated by C3 charging itself through R5. Buffering this ramp is the source follower formed by operational amplifier (op amp) A in IC1. An oscilloscope connected to test point B reveals a linear ramp being reset each time the ac line signal crosses its zero point (Photo 1).

The ramp signal from op amp A travels to the non-inverting input (pin 10) of a voltage comparator (op amp B). This comparator



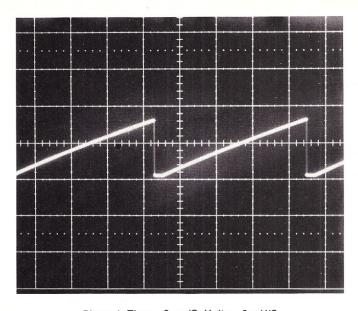


Photo 1. Time-2 ms/C. Volts-2 mV/C.

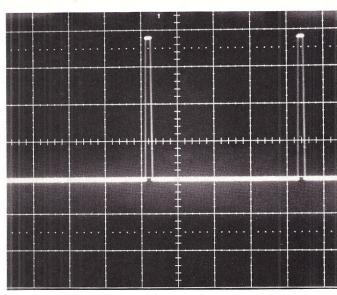


Photo 2. Time-2 ms/C. Volts-2 mV/C.

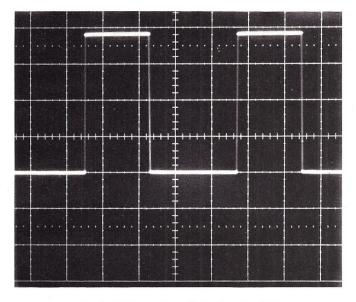


Photo 3. Time - 2 ms/C. Volts - 2 mV/C.

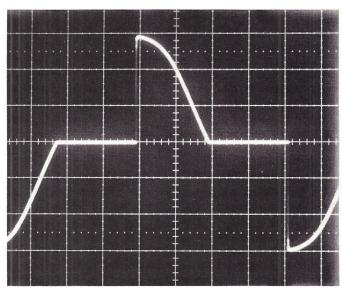


Photo 4. Time - 2 ms/C. Volts - 50 V/C.

swings into positive saturation as the ramp signal reaches a level almost equaling the reference voltage at pin 9. Resetting the ramp forces the comparator back into negative saturation. The width of the output pulse at pin 8, therefore, is determined by the voltage applied to pin 9. Q3 inverts this variable width pulse and correspondingly turns the LED in IC2 on and off.

To illustrate the importance of this variable width pulse, consider the following examples referenced to the positive half of the ac line signal. A voltage level at pin 9 slightly less than the ramp's maximum amplitude produces a narrow pulse at test point C (Photo 2). The output of this pulse is timed to occur as the positive swing of the sine wave approaches its zero potential. Lowering the voltage at pin 9 produces a wider pulse at the comparator's output (Photo 3), whose leading edge occurs earlier in the sine wave's positive swing.

The sine wave's negative half duplicates this pulse pattern.

Pulses from the comparator turn the LED on and off and, therefore, trigger the lightactivated silicon-controlled rectifier (LASCR) in IC2. This LASCR, working in conjunction with a full-wave bridge (diodes D6, D7, D8 and D9), helps to generate a series of pulses that eventually reaches the triac's gate through R18. And this finally switches the triac on and off so that current flows through the load.

In summary, the amount of current passing through the load relates directly to the triac's rapid on-off action. A low-level signal at pin 9 triggers the triac early in the sine wave when more current can ultimately pass through the load. Conversely, increasing the dc potential at pin 9 reduces the triac's on time and decreases its output

Photo 4 illustrates how a triac's switch-

ing action literally slices up the ac sine wave. The pulse chain producing this example is sampled in Photo 2. In this case, the triac is driving a 300 watt incandescent load at 80 volts true rms.

At this point, the circuit represents a simple voltage-controlled dimmer. Unfortunately, an inverse relationship exists between control voltage and actual dimmer output. Solving this inconvenience requires the addition of op amp C. Output from this amplifier equals the voltage at pin 12 minus the voltage at pin 13.

The circuit reveals that the minimal signal at pin 12 must normally be slightly less than the ramp's maximum amplitude. R10 provides this signal and correspondingly acts as the dimmer's idle or low-end adjustment: The dimmer will start to idle if 0 volts appear at pin 13 and R10 supplies pin 12 with a dc signal just below the ramp's maximum amplitude. Raising the voltage at

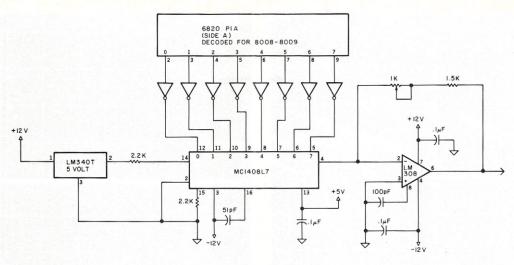


Fig. 2. Digital-to-analog converter circuit.

pin 13 increases the dimmer's output. Op amp D, configured as a source follower, buffers the dc input signal at pin 3, IC1.

By adding op amp C, the dimmer's output becomes a positive function of control voltage input. At 0 control volts, the dimmer idles or remains off; at 5 control volts, the dimmer reaches full power. Op amp C further serves as a sensing circuit along with R6, R7 and R8, all of which monitor linevoltage variations.

An appreciable drop in line voltage decreases the dc potential at pin 12 via R6 and R8. And, because of the summing mode of op amp C, the voltage at pin 9 is also reduced. It is this reduction that forces the triac to advance its firing angle and thereby provide compensation for apparent line loss. Incidentally, R8 sets the sensitivity of this circuit.

This means that computer control of the dimmer's output can be achieved by connecting a digital-to-analog converter to the dimmer's control-voltage input. Since this arrangement only requires two wires, you can easily install the dimmer in remote locations. Almost any DAC will do, providing it outputs a 0-to-5-volt signal. The converter in Fig. 2 works well for general applications and is driven by a simple PIA port. Note the PIA's inverted output. On my system, this inversion helps because a manual reset drives the PIA outputs high. Inverting the port adjusts the DAC's output to 0 volts after each reset.

# Construction

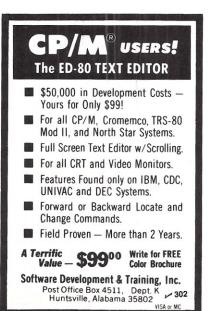
Constructing the dimmer is simple. You can print a PC board from the actual-size foil pattern in Fig. 3; Fig. 4 details the correct parts layout. An assembled board is pictured in Photo 5, and Fig. 5 presents the final wiring diagram.

Avoid connecting the dimmer's power supply common to the ac line ground. Also remember to polarize the plug by connecting the black wire to the hot side of the ac line and the white wire to the neutral side. The all-important safety ground, the green wire, must be attached to the dimmer's metal enclosure. Follow this procedure to protect both you and your equipment from dangerous electrical shocks.

Take special care to locate the dimmer's power outlet on the neutral side of the triac to provide a specific safety measure intended to reduce the possibility of inadvertent shock. Wiring the plug into the triac's hot side increases the danger of electrical shock because the full ac line power is always just a fingertip away, even with an inactive or idling triac. Placing the plug on the neutral side forces both sides of the outlet to remain essentially at ground potential whenever the triac is off or in a high-impedance state.

The triac's rapid on-off switching produces current surges that generate significant radio-frequency interference (rfi). Long







circuit wires act as transmitting antennas for such noise. To counteract this, shield or twist the triac's gate leads and keep them short. Rfi can also travel down the ac line. This can be largely corrected by utilizing a 100 mH choke (L1) and a bypass capacitor (C5).

# **Testing and Adjustment**

Test and adjust the dimmer before you connect it to your computer. Start testing and adjusting procedures by centering pots R10 and R22. Connect an ordinary 60 watt lamp to the dimmer's output. Plug the dimmer in and adjust R10 until the lamp just barely begins to glow. Unplug the dimmer and replace the lamp with a load approximately equal to 50 percent of the dimmer's intended capacity. Apply power and readjust R10.

If you have a spare 5 volt power supply, the next step will be easy. Just attach a 10k potentiometer across the supply leads. Adjust the pot for a 2.5 volt output. Connect this signal to the dimmer's control voltage input and adjust R22 for 79 true root mean square (rms) volts across the load. Making this adjustment requires a true rms meter; ordinary ac meters are designed to measure relatively smooth sine waves and not the fragmented signals produced by triacs.

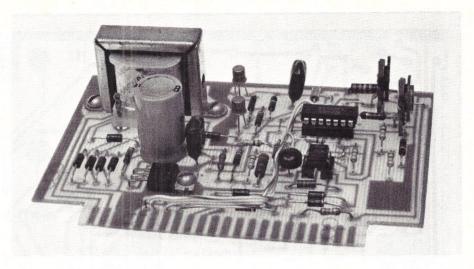


Photo 5. An assembled circuit board.

Producing the 79 volt true rms value at a 2.5 volt control signal helps produce a satisfactory visual curve for the dimmer. Because the human eye perceives light in a somewhat logarithmic fashion, the smooth control of incandescent loads requires that a nonlinear relationship exist between control voltage and true rms output.

Put another way, calibrating in this manner forces the dimmer's luminary output to appear as if it were actually a linear function of control voltage input. A more comprehensive explanation of this phenomenon is beyond the scope of this article. You should also realize that this adjustment slightly limits the dimmer's highest output to about 115 volts, an insignificant loss with incandescent loads.

To calibrate without a true rms meter, increase the control voltage to 5 volts and attach a standard ac meter across the load. Turn R22 fully clockwise. The meter should

# TWARE PRODUCTS IN TRS-80

# NEW!

WHISTLER: HOME CONTROLLER INTERFACE - \$34.95. New hardware product that controls lights, appliances, computer peripherals, darkroom timers and other 115 volt devices anywhere in your house! Software controlled by cassette cable. Use with Sears or BSR Home Control System with ultrasonic option. Assembled, tested, self-contained, and includes Basic software.

TRS-80 DISK & OTHER MYSTERIES - \$22.95, H.C. Pennington. Best disk book we've seen! Directory secrets, file formats, damaged disk recovery, etc.

LEARNING LEVEL II - \$15.95, D.A. Lien. Learn Level-2 like you did Level-1, step by step. Same author and style as Level-1 manual. Super new book!

# UTILITIES

RSM-2: MACHINE LANGUAGE MONITOR FOR 16K TRS-80'S - \$26.95
RSM-2D: THREE VERSIONS OF RSM-2 FOR DISK SYSTEMS - 29.95
RSM-2 RELOCATOR: PUT RSM-2/2D ANYWHERE IN MEMORY - 9.95

Machine Language monitors with Z-80 disassembler! HEX and ASCII memory dumps; EDIT, MOVE, EXCHANGE, VERIFY, FILL, ZERO, TEST, or SEARCH memory, read/write SYSTEM tapes, enter BREAKPOINTS, PRINT with TRS232 or Centronics, read/write disk sectors directly! RSM-2 tape loads at top of 16K LEVEL I or II; RSM-2D disk includes 3 versions for 16K, 32K and 48K.

DCV-1: CONVERT SYSTEM PROGRAMS TO DISK FILES -\$9.95. Execute Adventure, Air Raid, RSL-1, ESP-1, T-BUG, etc. from disk, even if they interfere with TRSDOS! New version works with TRSDOS 2.3.

BASIC-1P: LEVEL-1 BASIC WITH PRINTING! - \$19.95. Run any LEVEL-I BASIC program on your 16K Level-2. PLUS LPRINT and LLIST with our TRS232 or Centronics. Furnished on tape; can be used from disk.

# MACHINE LANGUAGE GAMES

AIR RAID, BARRICADE or RSL-1: - \$10.00 each, all 3 for \$25.00

AIR RAID: A super shooting gallery; our most popular game. Ground based missile launcher shoots high speed aircraft! Hours of fun!

BARRICADE: "BREAKOUT" for the TRS-80! Break through 5 walls with high-speed ball and keyboard controlled paddle! 96 different options!

RSL-1: Enter patterns with repeating keyboard! Save patterns on tape (4 furnished). Play John Conway's LIFE. FAST — about 1 second per generation!

SMALL SYSTEM SOFTWARE 🧱 P.O. BOX 366 📖 NEWBURY PARK, CA 91320

# MODEL-II TRS-80

CP/M" VERSION 2.0 FOR THE MODEL-II - \$170.00. Latest version from Digital Research. Runs both single and double density disks! "Standard" version runs nearly any CP/M software, including Cobol, Fortran, C-Basic, M-Basic, business and accounting packages, etc. Hundreds of programs available!

ENHANCED RSM MONITOR FOR THE MODEL-II - \$39.95. Relocatable version of RSM-2D plus screen editor for modifying either memory or disk sectors both Hex and ASCII, split screen scrolling, and formatted serial or parall printing. Sold on self-booting disk; directions to save as TRSDOS file.

# PROFESSIONAL SOFTWARE

THE ELECTRIC PENCIL FOR THE TRS-80: TAPE-\$99.95, DISK-\$150.00. Popular video editor for creating and saving text files. Prints formatted copy with right justification, page titling & numbering, etc. Upper case only, or lower case with modification. 16K Level-1 or 2 (tape).

Bus for the Model-1 TRS-80. Includes TRS232 and RS-232-C software, lower-case support, debounce, DCV-2 and other unique utilities. Allows use of many available programs written for CP/M.

# PRINTER SUPPORT

TRS232 PRINTER INTERFACE - \$49.95 (\$59.95 after June 30). Assembled & tested printer interface for RS232 or 20-mil current loop printers. Expansion interface not required. Print from level-II BASIC, CP/M, BASIC-1P, ELECTRIC PENCIL, etc. Standard cassette software included. Add \$2.00 for shipping.

TRS232 "FORMATTER" SOFTWARE PACKAGE - \$14.95. Adds page and line length control, printer pause, "smart" line termination, etc. to TRS232.

RSM232: Adds RS-232-C canability to RSM-2/2D monitors - \$9.95 RS-232-C for cassette version Electric Pencil - 9.95 TRS232 and RS-232-C for tape version of EDTASM - 9.95

# OTHER PRODUCTS FOR THE TRS-80

ESP-1: \$29.95. Assembler, Editor, Monitor (8080 mnemonics)
LST-1: 8.00. Listing of Level-1 BASIC with some comments

\*\*CP/M tm Digital Research, Inc. \*TRS-80 tm Tandy Corp. See your dealer or order direct. Calif. Residents add 6% tax

SMALL SYSTEM SOFTWARE P.O. BOX 366 NEWBURY PARK, CA 91320

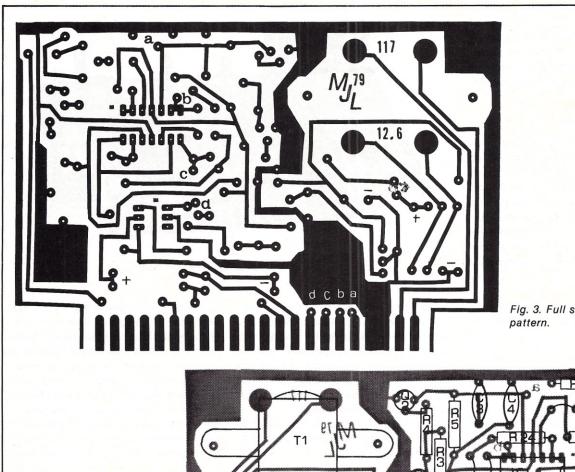
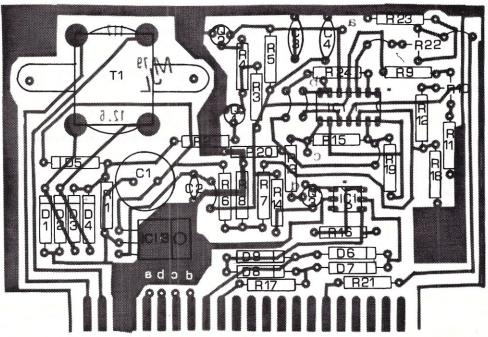


Fig. 3. Full size PC board foil pattern.



read between 115 and 120 volts. Now slowly rotate R22 counterclockwise until the meter indicates a 2 volt decrease from the previous reading. A fairly accurate curve can be achieved through this alternate procedure.

Fig. 4.

Alignment for universal ac motors is largely a matter of personal preference. Just remember that R10 adjusts the dimmer's idle level, and R22 determines its maximum output. These controls can also establish a confined operating range for the dimmer. R10, for example, might be set so that the dimmer's output will never fall below half power. Computer control would then range from half to full power. Also,

when working with an electric motor, avoid overheating conditions that occur when a motor stalls or operates too slowly.

After testing and alignment, check again for wiring errors that might produce ground loops. Use an ohmmeter to make certain that no conductive paths exist between the ac line plug pins and the control voltage wires. If the dimmer passes this test, it can be attached to the computer's DAC.

Fig. 6 illustrates a convenient way of making this connection. Flexibility is gained through S1, which affords you the opportunity to select manual, computer or external control. Making this connection prepares the dimmer for actual software im-

plementation.

# Software

My system is an odd blend of parts, but, in general, it likes to assume the identity of a 6800-based unit with a MIKBUG monitor. And, as I've said, the computer's DAC is driven by a PIA at \$8008 and \$8009.

Systems configured like this can use Listing 1 to program a 6820 PIA to act as an eight-bit latching port. Load the program and place the hexadecimal data to be transmitted into memory location \$000D. After this, load the starting address (\$0000) into \$A048 and \$A049. Type G, and the port will respond by sending the DAC its data.

# Here's The Second Half . . .



**Second Edition** \$1595 (soft cover)

Written by the author of your Level II Users Manual, LEARNING LEVEL II picks right up where the Level I Manual leaves off. It even supplies the changes needed to make the Level I Manual compatible with your Level II TRS-80.

LEARNING LEVEL II covers all Level II BASIC beyond Level I, plus much more. It shows you how to use the Editor, explains what the many error messages are really saying, and leads you thru conversions of Level I programs to Level II.

Dual cassettes, the Expansion Interface with Real Time Clock, use of printers and other features are explained in the same easy-to-learn style that made the Level I Manual famous. LEARNING LEVEL II was created specifically for your Level II TRS-80!

# Yes, I want to LEARN Level II!



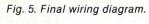
COMPUSOFT™ PUBLISHING • 1050E<sup>K10</sup> Pioneer Way • El Cajon CA

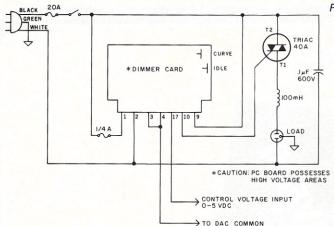
×32

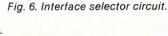
copies of LEARNING LEVEL II. My check for \$15.95 each + \$1.45 P&H is enclosed. (CA addresses add 6% sales tax).

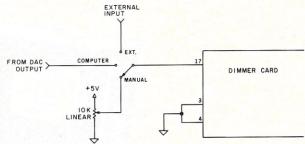
I understand my order will be shipped promptly and there is a 30 day money-back guarantee.

NAME \_ ADDRESS \_\_\_\_\_ CITY \_ STATE ZIP CODE.









```
8009
                                          Initialize PIA into Latching
0003
      86
                    LDA A
                           #$FF
0005
                           $8008
          8008
      B7
                   STA A
0008
      86
                   LDA A
                           #$04
000A
          8009
                   STA A
                           $8009
      B7
000D
      86
          XX
                   LDA A
                           #$XX (DATA)
                                          Load and Send Data
000F
      В7
          8008
                   STA
                           $8008
0012
      3F
                                          (Change to 39 for User Routine)
                         Listing 1. PIA routine.
```

REM DIMMER CONTROL ROUTINE REM ESTABLISH USER PROGRAM LOCATION POKE (103,30) 40 POKE (104,175) REM NOW INPUT DIMMER LEVEL 50 INPUT "LEVEL", IF X > 255 THEN 60 70 REM INVERT THIS VALUE LET Z=255-X 100 POKE (7869,Z) REM CALL USER ROUTINE 120 IFT A=USER(7) REM PRINT DIMMER LEVEL ON SCREEN 140 LET Q=255-A 150 PRINT 160 PRINT Q 170 GOTO 60 180 END

Listing 2.

Relocating the routine is no problem, but remember to clearly identify the data byte's storage location. For PIAs not at \$8008, alter the program's address calls. Notice, too, that the circuit in Fig. 2 inverts the PIA's output, which means that data byte must be a complement value.

If you change the last instruction of the listing to RTI (39), the routine will work nicely in the user space of SWTP BASIC. To program dimmer output, poke an appropriate decimal value (0 to 255) into the data location and jump to the user routine. Control returns to the BASIC interpreter after the PIA has latched. Dimmer output remains

stable until another command reactivates the DAC.

Listing 2 is an example of how POKE commands can interact with Listing 1. In this case, the program has been relocated to \$1EAF, the beginning of user space in SWTP BASIC (ver 2.0). The first two instructions poke the address of the user routine into memory locations \$67 and \$68. This tells the interpreter where to transfer control when using the user command. The input instruction requests a dimmer "level," which must be entered in decimal format (0 to 255). This value is inverted and poked into \$1EBD. The dimmer level then appears on the terminal's screen, and the program requests another input.

User routines can be frustrating, especially when coupled with POKE instructions. One mistake can cause the interpreter to self-destruct or damage the user program. Some protection can be afforded by carefully defining user space in advance. With SWTP BASIC, for example, start the process by initializing the interpreter to

# **UCSD\*** System for TRS-80 Model

The most portable operating system now supports FORTRAN. Pascal and/or FORTRAN modules are compiled in universal P-code, so they can run on most microprocessors, often without recompiling. Programs execute up to 10 times faster than comparable BASIC programs, and use much less memory. Ready to run on TRS-80 Model II (64K).

# **FEATURES**

- Interactive operating system—dynamic overlays, disk file handling, run-time support and block I/O routines.
- Fast, one pass compilers.
- Two Editors—one screen oriented for programming and text editing, one character oriented for hard copy terminals.
- File handler to manipulate disk files.
- Macro-assembler that produces code for linking with Pascal or Fortran programs. Linker for link-editing of object and as-
- sembly code modules. Library of program modules and utilities.

# PLUS, from PCD Systems

- Disk formatting program to initialize diskettes in single or double density formats.
- Configuration program for serial I/O.
- Disk-set program to permit separate assignment of density and format characteristics for each disk drive.

# DOCUMENTATION

- UCSD System Manual (400 pages).
- Beginner's Guide To UCSD Pascal.
- Pascal User Manual & Report.
- Fortran User's Manual with Fortran

PO Box 143 Penn Yan, NY 14527

315-536-3734

# **PRICES**

■ UCSD System with Pascal Compiler \$350 with Pascal and Fortran Compilers \$500 Fortran Compiler alone

\$200

\$ 85

- (requires Version II.0)
- P-Code Interpreter alone (either LSI-11 or Z-80)

# **Optional Utility Programs**

- CP/M<sup>‡</sup> to Pascal file conversion \$ 50 ■ TRSDOS<sup>†</sup> to Pascal file conversion \$ 50
- Z-80 Disassembler/Dump program \$ 50
- **ALSO AVAILABLE** ■ UCSD System for MINC® or PDT®.
- Z-80 Adaptable System (you write BIOS).
- UCSD System for CP/M environments.

PCD Systems is a licensed distributor of the UCSD System for Pascal and Fortran. Dealer inquiries are invited.

\*Trademark of the Regents of the University of California \*Trademark of Tandy Corporation \*Trademark of Digital Research \*Trademark of Digital Equipment Corporation



Kilobaud MICROCOMPUTING offers the reader:

more pages of articles monthly than any other microcomputing journal reviews, programs, applications, projects and ways to save hundreds of dollars

# Kilobaud MICROCOMPUTING offers you a great way to say MERRY CHRISTMAS.

What better way to say MERRY CHRISTMAS to: your friend your boss

your business associate even your father-in-law than with a subscription to Kilobaud MICROCOMPUTING.

My Name				
Address		and the same		
City		State	Zip	
,				
	one year gift subscription to:			
	one year gift subscription to:			
Please enter a	one year gift subscription to:			

verify the cassette load. After this, manually reset the computer and allocate user space by placing the desired byte in \$104E. Complete the sequence by exercising a hard rather than a soft start. This procedure forces BASIC to recognize the new parameters that distinguish user space from memory dedicated to normal variable and program storage.

The principles expressed in these examples can be applied to more complex programs that simultaneously control several dimmers. To do so, however, requires that the detailed work of controlling and selecting dimmers must be accomplished by efficient user routines. The BASIC interpreter may be easy to work with, but, in general, it is too slow to directly implement complex and fast-shifting lighting effects.

# Conclusion

Here are some brief comments concerning the design philosophy surrounding this dimmer. One approach was the creation of a purely digital dimmer with the ability to interpret serial or parallel data commands; for certain applications this seemed keenly advantageous. In my case, however, a mixture of digital and linear techniques worked best. The need to utilize long remote-control

lines was the deciding factor. To run 16 analog lines from a computer is infinitely easier than extending and decoding 16 serial lines.

Also, consider the problems associated with implementing manual override when using serial data. At least the linear circuit makes manual or independent control easy to work with. You can even intermix manual and computer control by presetting the independent potentiometer and driving it with the computer's DAC. Try such intermixing

with an ACIA or UART.

In retrospect, then, this article shows how digital and linear techniques can merge to produce a versatile tool with many applications.

The author wishes to thank the San Diego State University Foundation, which helped support this work through a faculty grant-in-aid.

D1 through D9 - 1N4004 diode C1-470uF 50V electrolytic capacitor

C2, C3, C4 - .1uF 50V ceramic

C5 - .1uF 600V

R1 - 1000 Ohms

R2-1000 Ohms

R3-4700 Ohms

R4 - 1000 Ohms

R5 - 220,000 Ohms

R6-10.000 Ohms 1%

R7 - 100,000 Ohms

R8-470 Ohms

R9 - 1500 Ohms

R10-2000 Ohms PC trimmer

R11 - 100 Ohms

R12 - 100,000 Ohms

R15 - 100,000 Ohms

R16 - 47,000 Ohms

R17 - 330 Ohms

R18 through R21 - 100,000 Ohms

R22-100,000 Ohms PC trimmer

R23-68,000 Ohms

Q1, Q2 - 2N2222 npn transistor

Q3-2N3567 npn transistor

Q4-2N5445 40A triac, or T6420D (isolated stud 40A triac)

L1 - 100uH choke (current rating dependent upon triac selection)

IC1 - LM324 quad op amp

IC2 - LM340T-12, + 12V regulator

IC3 - MCS2400 optical coupler T1 - power transformer, 12.6VAC

300mA secondary, PC mount (Radio Shack 273-1385)

Parts list. All resistors 1/4 watt 10 percent, unless otherwise noted.

# AND MODEL II BUSINESS SOFTWARE? WE HAVE HUNDREDS OF QUALITY BUSINESS PROGRAMS IN STOCK! AT PRICES YOU CAN AFFORD.

# WHERE YOUR TRS-80\* MEANS BUSINESS>

For the first time you can fill most of your software needs with one telephone call. Whether you are trying to find a specific program, custom software or just help with your system—give us a call. Invoicing • Inventory Control • Accounts Payable • Accounts Receivable • Payroll • General Ledger • Letter Writer • Word Processing • Mailing • Manufacturing Inventory • Cost Accounting • SalesReporting • Stock Market • Business Statistics • Statistical Analysis • Data Base Systems • Medical Billing • Dental Billing • Special Industries • Advanced Accounting • Income Tax • Language • Personal Finance • Technical Programs • Insurance • CPA • Law Office • Asset Depreciation • Job Cost • Utility Programs • Education • Games • Home Programs • Loans • Credit Bureau • Electronics • Test Systems • Sports • Art • DOS Systems • BASIC lessons • and much more!

Send for our free catalog or give us a call today. We also do custom programs as well as buy top quality programs.

**Summer Special:** 

Complete business system \$299.95

# OVER 100 OF THE BEST BUSINESS PROGRAMS FOR THE TRS~80\* MODEL I AND MODEL II IN STOCK READY FOR IMMEDIATE DELIVERY.

# LET US ANSWER YOUR QUESTIONS TODAY.

We now sell: Structured Systems Group ● Graham Dorian ● Magic Wand™ ◆ Digital Research, Inc.
 ◆ Osborne/McGraw Hill
 ◆ Compiler Systems • Software Mart Software

Software-Mart -32

24092 Pandora St • El Toro CA 92630

In California Call (714) 768-7818 Call Toll Free 1 (800) 854-7115



master charge 24 Hour Service VSA



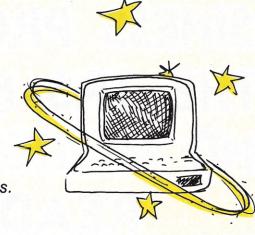
OUR BEST ADS ARE NOT WRITTEN - THEY'RE RUNNING ON TRS-80'S

II Software Mart Programs are sold on an "as is" basis and with "All Faults" Prices and programs are subject to change without notice. Magic Wand™ is a Trademark of Small Business Applications, Inc.

\*TRS-80 is a trademark of the Radio Shack Division of Tandy Corporation.

# OSI In the Sky

A heavenly approach to handle subscriptions.



# Out of the Blue

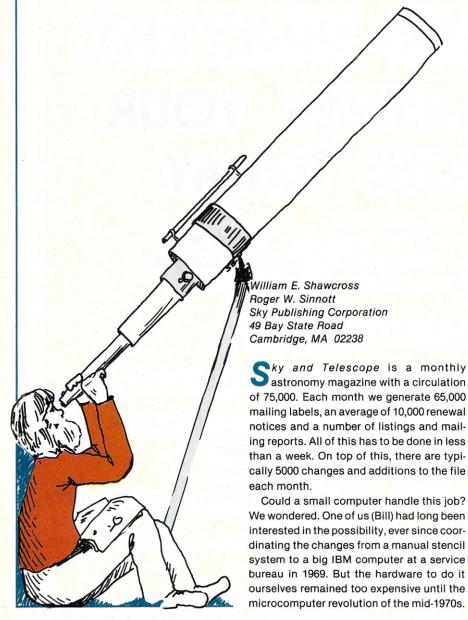
Roughly three years ago, Ohio Scientific introduced the C3-B, a rack-mounted microcomputer with dual eight-inch floppy-disk drives and a 74-megabyte Winchester hard disk. Our data base, then almost ten megabytes, had been too large for floppies, but the Winchester was just right. We were fortunate to have an OSI dealer in Cambridge, and so we visited Robert Rivers at the Computer Shop. A demonstration convinced us that the machine had enough speed and capability for our needs.

And so a year ago, after 1 1/2 years of preparation, we transferred our mailing list from the IBM 360/30 at the service bureau to our own in-house OSI computer. We were looking primarily for convenience; we didn't want to rely on the mails to get our subscription material (punched paper tape) back and forth from the service bureau. With our own computer, we would be able to put new subscribers on the system the day their names came in. We could also let the computer do a number of office jobs that for years we had done by hand.

The major unknowns were reliability and file backup, which are critical in converting to an in-house computer. At the time, cartridge-tape backup units were not available, and standard tape drives with formatters cost as much as the C3-B.

A magazine article on computer repair led us to the solution of both reliability and backup - get two identical computers. This would let us keep the files in separate places (in our case, in separate buildings). Regular copying from one machine to the other would keep the backup file within a month of being up-to-date. And circuit boards could be swapped easily in a pinch.

On this basis we took the plunge. We





The new OSI C3-B computer, Printronix 300 and a Soroc terminal by which the same job is now done more efficiently in-house at Sky and Telescope. (Photos by Dennis diCicco)

bought the first computer in August 1978, and the second one the following February. We ordered a Printronix 600 line printer (600 lines per minute) but eventually had to settle for a Printronix 300. We bought a used Centronics 100 printer with the first computer so we could do development work. Our suite of equipment was rounded out with a Tab miniburster (with slitter), Tab decollator, a Hazeltine 1500 terminal and three Soroc IQ-120 terminals. The total cost was around \$45,000.

Getting the equipment was just the start. The real effort had to go into programming, which proved very time-consuming.

Neither of us was completely new to computers. Bill had gone to programming school and had put together one of the very first Altair 8800 kits. Roger had bought the Altair from Bill and learned North Star BASIC on it. Bill took over project management and definition, and Roger gave up some of his editorial duties so he could spend about half his time on programming. The project took a whole year.

In the late 1960s, Bill had helped define the functions of the mailing package used by our service bureau, and therefore knew what it did and how it did it. We assumed it would be a fairly easy matter to duplicate the functions of the big computer. But there were two areas in which we badly underestimated how much work we had to do.

# **Software Problem and Solution**

The first of these was learning, in minute detail, how the Microsoft BASIC interpreter interacts with large files on the OSI 74-megabyte disk. For most hacking this is not a serious matter, but when you're trying to design as efficient a system as possible, everything counts. For example, Roger eventually found a way of copying large files that runs three times faster than the copying utility supplied by OSI.

On a large mainframe computer, a magazine subscription list is usually kept in serial order on a reel of magnetic tape.

Changes are input, sorted and then processed against the tape. A new tape is made (on another tape drive) incorporating the changes. Such sorting and merging, however, is utterly impractical on a micro with a BASIC interpreter. We guessed that to merge two files to a third place on the disk would take us at least 20 hours for each weekly update.

A double-size file that stays put on the disk was our solution. Here, on the average, every other record is a blank, or "hole." Since our mailing list is in zip-code order, and names are alphabetical within each zip code, a binary search of about 17 seeks will find a record that needs revising in about six seconds. If a new subscriber is to be inserted, the same amount of time will locate the appropriate hole. Occasionally, a bit of spreading is needed to make room for the new person, if some records are bunched together. Our updating program does this automatically.

In essence, we have an on-line system that is run from floppy disks rather than directly from the keyboard. Since an audittrail report is needed for all file transactions to satisfy the Internal Revenue Service and the postal system, putting the work on a floppy first means that the line printer does not have to be running except when the floppies are being processed against the master file (about 30 minutes, at the end of each day's work). And since the data base is copied to the backup computer only once a month, we save four weeks of floppies in case the primary computer should ever fail. A floppy-based system thus has many im-



The service-bureau computer room, with numerous tape drives, where the Sky and Telescope subscriptions were processed between 1969 and 1979. It is operated by Computac, Inc., in West Lebanon, NH. The Sky and Telescope circulation department prepared punched paper tape (on a Friden Flexowriter) that was delivered to Computac weekly, containing all the names of new subscribers or renewals in machine-readable form.

portant advantages.

### **File Transfer**

Our second major problem was getting our data base out of IBM-land and onto our own machine. We thought of a number of possibilities: punched paper tape (16 miles of it), the telephone (90 hours of long-distance charges), a 1/2-inch computer tape (rental drives not readily interfaced to OSI) and rekeyboarding all the names and addresses (1000 hours for a good typist).

Floppy disks seemed the only possibility, but there was a catch here too. Our service bureau could supply the file on eight-inch floppies, recorded in the standard IBM format of 128 bytes per sector, 26 sectors per track. OSI uses the same hardware but a different format. In fact, OSI's format seems to be unique in the industry, so buying software from other sources is difficult.

Here Roger's Altair came to the rescue. We bought a Tarbell S-100 disk-controller board and attached the OSI floppy drives to the Altair. A word of caution: OSI supplies the -5 volts from the CPU power supply through the connecting ribbon cable, rather than from the floppies' own power supply. This caused us a major headache until Roger traced the problem down.

An assembly-language routine for the Altair read each track-size block of 13 names and addresses from a floppy into RAM, inserted ASCII carriage returns in all the right places and sent them out a serial port at 9600 baud to the OSI computer. There, a BASIC program accepted each character string in turn and sent a hand-shaking character back to the Altair when it was ready for the next string. (This was necessary because the Microsoft BASIC interpreter seemed to take unpredictable amounts of time to assimilate the strings as they came in.)

When 13 names and addresses had been transferred, the OSI computer paused for half a second to store them sequentially on the hard disk and asked for more. The Altair then read in the next higher track, and so on. Proceeding in this manner, the two computers worked without intervention for about seven minutes to transfer all 949 names on a floppy. It was a complicated operation, to be sure, but when things were going smoothly it was spectacular to watch!

In this way the file was transferred, at a mere cost of \$250 for the Tarbell board and \$200 to the service bureau to have them put the file on 69 floppy disks we had provided (and which we are now reusing for our daily work). We did the transfer when our other software was essentially done, so that we could try out our own system in parallel with that of the service bureau for a couple of months to be sure the results were the

same. Six months is usually recommended, but the duplication of several thousand transactions a month was putting a severe strain on our circulation department of just three people. Fortunately, all went well, and we were able to complete the changeover in November 1979. We have been self-sufficient ever since.

# **System Operation**

As it now stands, our system lets us enter on floppies new subscriptions, renewals, address changes and deletions. This can be done with more than one terminal at once, if necessary, thanks to the OSI time-sharing option. The operator can request adhesive mailing labels to be printed so the current issue of the magazine can be sent immediately—something that used to be done by hand.

We also have two programs for locating particular people in the file. The first uses the same binary search technique mentioned earlier. If you know a subscriber's zip code and a few letters of the last name, the record can be called up in six to seven seconds. (Sometimes the program tells you that the name is not currently in the file.)

The second method sweeps through the file from any starting place to the end, looking for a specified character string of up to 32 characters. Thus, for example, if Ebenezer Jones lives somewhere in California, it makes sense to use his first name as the search string and to start looking at zip code 90000. All too often, a person sends in a change of address with the old address missing! This kind of search, from one end of our 23 megabyte file to the other, can take as long as 18 minutes.

Along with renewal notices and mailing labels, the system produces a monthly geographical breakdown by zip code, used for postal reports, and various file dumps. We also make a printout each month of the names of people who decided not to renew; this list can be used at a later date, in case we want to do a selective mail campaign.

We still need to speed up the file transfer between the two machines. This procedure now takes about 3 1/2 hours at 19,200 baud over a 100-foot coaxial cable. The OSI serial ports can be jumpered for 250,000 or even 500,000 baud as soon as we find time to write the assembly-language handlers for synchronous data transfer. This should cut the time to under half an hour for the 23 megabytes.

# **Extraterrestrial Applications**

We have found other uses for all this computing equipment. One nice feature of the Printronix 300 is its ability to serve as a plotter. Roger has written a program that prints out a chart showing the motions of Saturn's moons; all we do is add labels and

send it off to the camera department for use in *Sky and Telescope*. Most days of the month, the second (backup) computer is available for use by our scientific staff.

Another area in which the computer helps is our advertising billing and accounts receivable—a sizable portion of our income. For this we bought the OSI Data Management System nucleus and modified parts of it to print our bill forms. This software may not be the fastest or most elegant in the world, but it is dependable, easy to work with and reasonably priced (\$300). It has general-report writers and file handlers, allowing easy maintenance of a small advertiser mailing list. We also have a separate dealers file for addressing the new price lists of the books we sell.

# A Successful Flight

We have faced few difficulties since the changeover — and none that has caused us to miss a schedule. This is probably due in large measure to the fact that we know a lot about our equipment, and everything there is to know about our subscription programs. The usual memory glitches (chips go bad from time to time) and a dead LED in a floppy drive (it couldn't find the index hole) are the only equipment failures we have had in two years.

We had some strange error messages and the like when the computer-room temperature rose above 80 degrees Fahrenheit. The equipment behaves strangely at such temperatures, so we now use air conditioning when needed to keep the room from getting warmer than 75 degrees.

Also, though the OSI manuals warn against shutting off the CPU before the hard disk, we have inevitably done this accidentally a couple of times. Sometimes it doesn't have any effect, and other times it wipes out the operating system on the disk and forces us to get the backup floppy out of a vault. (Why can't the equipment be designed so that it doesn't matter how you shut it off?)

A dependable dealer nearby is a great help. Bob Rivers at the Cambridge Computer Shop and Ed Craddock at the Boston branch have helped us often both with suggestions and new software releases.

Make a careful estimate of how long it will take to program an application and then double or triple the time. Don't get yourself into a corner with rigid scheduling — equipment is seldom delivered as soon as you expect, and software is almost never released on the date first announced. Anticipate being discouraged and ready to give up every now and then, particularly during the development phase.

And, above all, enjoy the satisfaction of a difficult project finally brought to fruition.

# Now You Can Put a TRS-80° Computer In Your Pocket! Radio Shack TRS-80

# Another Radio Shack Personal Computer Breakthrough!

Now you can carry computer power wherever you go. And with the TRS-80 Pocket Computer, you can create your own programs or purchase ours. These are available now: Civil Engineering, Aviation, Business Statistics, Games, Personal Finance, Math Drill, and Real

Look At These Exciting Features! 57-key alphanumeric keyboard. Big LCD display that scrolls left and right for program line entry and editing, and steps up and down for program listing. Programmable in an enhanced, easy-to-learn BASIC language. Built-in arithmetic functions including trig and inverse trig (with readout in degrees, radians or gradians) log, exponent, square root, angular conversions, integers and absolute values. Accuracy is to 10 digits and it can handle 2-digit

exponents. With array and 7-character string-handling ability you've really got a handful of computational power!

For

Only

Programs and Data Retained in Memory When Power Is Off! The 1424-step memory is automatically partitioned for program and data storage. There's a 26-data element memory and 48-step reservable memory.

Available Now! Exclusively at Radio Shack stores, dealers and Computer Centers. Complete with carry case, manual, batteries. Hurry, because everyone will want this sensational new computer. And what could make a better or more unique Christmas gift?

The biggest name in little computers<sup>®</sup>



# Nothing Else You Can Put In Your Pocket Can Do All This!

SHOWN ACTUAL SIZE!

 $(5/8 \times 23/4 \times 67/8")$ 

**WEIGHS ONLY 6 OUNCES!** 

10 Print "SHELL METZNER SORT": FOR X = 1 TO 100: PAUSE "DATA ITEM #", X:INPUT A(X + 100): IF A(X + 100 PAUSE "DAIA FIEM #";X:INPUT A(X + 100): IF A(X ) < 0 GOTO 25
20 NEXT X
25 M = X - 1
30 M = INT(M/2): IF M = 0 GOTO 107
40 J = 1: K = X - M - 1
50 I = J
60 BEEP 1: L = I + M: IF (A(I + 100) < = A(L + 100))

GOTO100

70 T = A(I + 100): A(I + 100) = A(L + 100): A(L + 100) = T: I = I - M: IF I < 1 GOTO 100 90 GOTO 60

100 J = J + 1: IF J>K GOTO 30 105 GOTO 50

107 BEP 5: INPUT "PRESS ENTER FOR LIST"; A 110 FOR I = 1TOX - 1: J = I + 100: PAUSE "DATA ITEM #"; USING "####"; I; ""; A (J): NEXT I

# Send Me Your FREE TRS-80 Computer Catalog!

Radio Shack, Dept. 81-A-23 1300 One Tandy Center Fort Worth, Texas 76102

NAME				
TITLE				
FIRM	2.8			
STREET		1000.71	The second	

CITY STATE

\*Retail prices may vary from store to store. Optional Cassette Interface, \$49. Minisette-9 Cassette Recorder, \$79.95.

# A New Branch On the Family Tree

# National Semiconductor sprouts the NSC800.

Ken Barbier Borrego Engineering PO Box 1253 Borrego Springs, CA 92004

The recently announced NSC800 microcomputer system from National Semiconductor represents a new branch on the 8080 family tree. It combines the best features of the 8080, the 8085 and the Z-80 with a new fabrication technique called poly CMOS. This proprietary new process (tagged "P2CMOS" by National) combines the speed of NMOS circuits with the low power consumption of CMOS.

Initial offerings in this product line include the NSC800 CPU, the NSC810 RAM-I/O-timer and the NSC830 ROM-I/O. All three are constructed using the same low-power P<sup>2</sup>CMOS. This chip set can be combined into a complete controller consisting of the three 40-pin packages, a crystal, one resistor and a capacitor.

This combination provides 2K bytes of ROM, 128 bytes of RAM and 32 bits of I/O that can be pro-

grammed to be either inputs or outputs. Power required can vary from 3 to 12 V dc, and the low power drain would enable full-speed operation for two days from a battery back-up system consisting of three D-size nicad batteries.

The familiar features of the new National microprocessor system should appeal to its users. The CPU uses the pin-out of the Intel 8085 and executes the entire Z-80 instruction set.

Rather than trying to establish a new dynasty of its own, National wisely copied the best features of earlier members of the 8080 family. This means that users of the earlier 8080, 8085 and Z-80 will be instantly able to design hardware and write software for the new microprocessor. Existing development systems, assemblers and PROM programmers can supply all the support required for this new system.

The NSC800 chip set and user's manual were not available as this was written, but the prospective user can gain valuable insight into techniques usable with the NSC800 by looking back at its predecessors. The reasoning

behind National Semiconductor's decision to merge the pin configuration of the 8085 with the instruction set of the Z-80 unfolds as we look back at the history and evolution of the 8080 microprocessor family.

# The Roots: Intel's 8080

The 8008 microprocessor was relatively insignificant compared to its big brother, the 8080. Since its introduction, the 8080 and its descendants have become the standards of the microprocessor industry. If you don't want to accept that fact, just look at the relative amounts of available software and the number of different computer systems based on the 8080 family, although other micros may provide features lacking in the '80 family.

The 8080 was not the ultimate. To implement any 8080-based system, the 8080 central processor (CPU) has to be supported by a bi-phase, high-level clock generator; a system controller; and bus buffers. In spite of this, however, new products are still being introduced based on the 8080, even though its successors provide greatly expanded capability

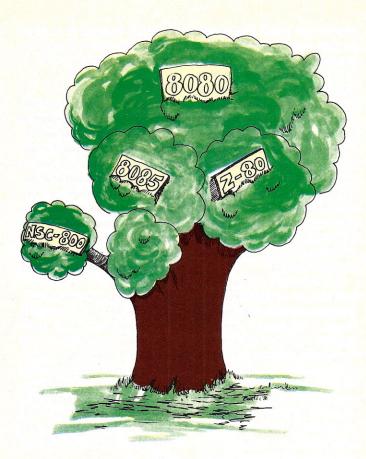
combined with reduced complexity.

To eliminate some of the 8080's support requirements, as well as add expanded capability, Zilog's Z-80 and the Intel 8085 have since appeared. These micros are upward compatible with the '80, executing the same instructions as the 8080 and adding instructions of their own.

# The Z-80 Instruction Mountain

The original designers of the 8080 used 244 out of the 256 possible combinations of eight bits as the basic instruction set. This left the door open a crack for the Zilog Z-80 designers to take advantage of the 12 unimplemented operation codes (op codes) to greatly expand the instruction set. With a couple of exceptions, this required a double level of instruction decoding.

The first eight-bit byte of the expanded instruction set tells the decoder that it will have to fetch an additional eight bits from the next memory location and decode that second byte to determine the desired operation. In this manner, 8-, 16-, 24- and 32-bit op codes have been implemented in the Z-80, at



the expense of additional memory fetches and execution time. Where speed is critical, as in servicing interrupts, the Z-80 executes two new single-byte instructions, the register exchanges EXX and EX AF.

The new multi-byte op codes implement functions that would have required many instruction and data fetches anyway, such as block data moves and bit manipulations, so there is still a net gain in efficiency in spite of the multiple-level decoding required by this technique.

While the major advantage of the Z-80 over the 8080 is the expansion of the instruction set, it also provides simplified interfacing to the outside world. Only a single-phase clock is required, and more usable bus control signals are provided by the CPU.

# The 8085

Perhaps in answer to the advent of the Z-80, Intel next introduced the 8085 microprocessor. At first glance, the '85 almost seems to be a step in the wrong direction. Adding only two instructions to the 8080 op code set, it is a far cry from the Z-80's mountain of new op codes. The 8085 shines in the

simplicity of implementing small systems, such as dedicated controllers.

The 8085 doesn't require an external clock generator. Simply connect a crystal across pins 1 and 2 to operate the '85. It even provides buffered clock output for other uses, such as supply-

ing a bus clock or an input to a baud rate generator. If crystal timing accuracy is not required, substitute ten cents' worth of resistor and capacitor for the crystal.

For controlling the real world in real time, the '85 provides five different hardware interrupts accessible through individual pins and, in addition, can still support the multilevel priority interrupts that are implemented in 8080 and Z-80 systems (as well as 8085 systems) by the addition of a separate interrupt controller. If five levels of hardware interrupt are enough for a particular application, however, all are instantly available at separate pins on the 8085.

Additional simplification is provided by the inclusion in the '85 of "serial" input and output ports — in actuality, a one-bit input and a one-bit output port. In many applications, a "software UART" program can be written to make use of the serial I/O lines and emulate the hardware baud rate generator, crystal and UART chip usually required for communication with a terminal device.

Several of the functions of the 8080's system controller are implemented internally in the '85, providing signals for controlling the flow of data to and from memory and I/O devices. If more detailed CPU status information is required, status lines are also available, as was provided by the 8080's controller.

If the '85 is used with older 8080-style peripherals or memory, these status lines may have to be decoded to provide full 8080 compatibility. However, all newer memory and peripheral controllers are fully compatible with the '85 bus control signals, and the status output pins can be ignored in new designs. The one exception is shown in Fig. 1, where the status lines and a single NOR gate are used to light a "halt" indicator.

# The Multiplexed Bus

To free enough pins in the standard 40-pin DIP package to provide for all these 8085 features, the eight-bit data and 16-bit address buses of the 8080 and Z-80 have been combined into a multiplexed eight-bit data-and-low-address bus and a non-multiplexed eight-bit high-address bus. An additional strobe comes out of the '85 on pin 30 to separate the data from the low-address bits on the multiplexed bus.

In any system—large or small—it is necessary to output a stable address before data

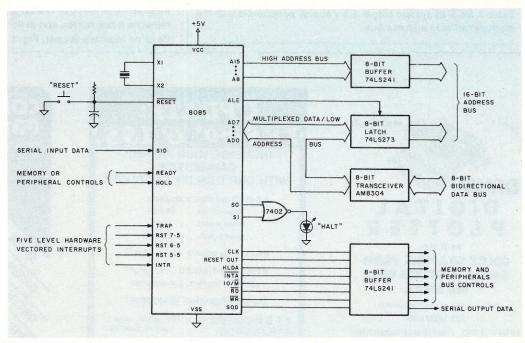


Fig. 1. CPU section of a maximum-size microcomputer based on the 8085. The four 20-pin ICs shown on the right can provide all the address, data and control lines for systems with up to 64K bytes of memory and 256 I/O ports. Five vectored interrupts are available without the need for external interrupt controllers. All 40 pins on the 8085 package are used in the configuration.

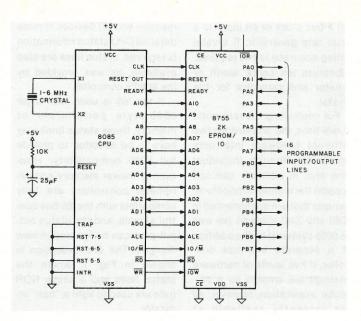


Fig. 2. A minimum-size controller based on the 8085 microprocessor. The 8755 is a 2K byte ultraviolet erasable EPROM combined with two 8-bit input-output ports. For "RAM-less" applications, where CPU registers can supply sufficient read-write storage, the components shown here can comprise a complete controller operating from a single +5 V dc supply.

<b>Device</b> 8155 8156	Package 40-pin DIP	Features The 8155 and 8156 both provide 256 bytes of RAM, a 14-bit counter/timer, two eight-bit I/O ports and a six-bit I/O port. These two devices have complementary chip enable levels, permitting them to be used together without external address decoding.
8185	18-pin DIP	A 1K byte static RAM in a small package, made possible by bus multiplexing.
8355	40-pin DIP	2K bytes of mask-programmable ROM; two eight- bit I/O ports.
8755	40-pin DIP	2K bytes of ultraviolet erasable EPROM; two eight- bit I/O ports. Pin compatible with the 8355, it permits program development for later inclusion in the 8355.

Table 1. MCS-85 system single + 5 V supply peripherals with the multiplexed data/address bus.

transfer can occur. This is true for read or write, memory or I/O operations. For this reason, there is no loss of time resulting from multiplexing address and data. The 16-bit address appears on the address bus (bits A8 through A15) and addressdata bus (bits AD0 through AD7) along with an address latch enable (ALE) strobe used to save the low-order address bits in external hardware. With the address stable, and following the ALE, the AD bits are used as a bidirectional data bus, just as in the 8080 and Z-80.

In minimum systems, a number of multiplexed-bus peripheral circuits use the ALE signal to differentiate between address and data information sequentially applied to the same eight pins. Fig. 2 shows that no external components are required to implement such a minimum system. Compatible peripheral chips can provide RAM, ROM or EPROM memory, combined with counters, timers and I/O lines (see Table 1).

In larger systems—with more RAM and ROM memory—the address and data buses from the CPU have to be buffered in any case, so there is no increase in package count between the 8085 bus and that of the 8080 or Z-80. The only difference is that an octal latch (8212 or 74LS273) replaces a bus buffer, and at little or no increase in cost. Fig. 1

shows the nucleus of a large system, with fully buffered address, data and control lines.

# The NSC800

The 8080 instruction set has become the industry standard. If you examine programs written for the Z-80, you will see that too many programmers use few, if any, of the Z's additional instructions. Many reasons exist for this deplorable situation: no Z-80 assembler available on older development systems, the difficulty of converting to a new set of mnemonics or just plain lethargy.

If you aren't using the extra instructions anyway, the recent price reductions and more widespread availability of the 8085 and compatible peripherals have made the 8085 more attractive. Designing hardware based on the '85 is a snap, and managers just love the low package counts that result, but if only it contained the Z-80 op codes!

Sprouting a new trunk on the 8080 family tree, National Semiconductor has combined the super pin-out of the 8085 with Z-80 instructions. Now you can have the '85 pin-out, with its five instant hardware interrupts, serial I/O and single component clock generator, and the Z-80 instruction set executing at one million instructions a second, run by flashlight batteries!



COLOR GRAPHICS FROM SMALL PLOTTERS WITH BIG IDEAS.

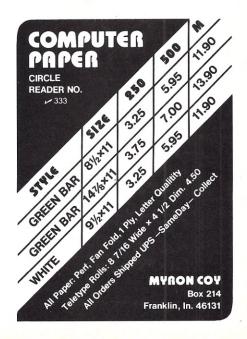
But draw the line on price. That's practical! 232 SERIAL IN

FROM \$310. SOFTWARE FURNISHED
WRITE FOR DETAILS TO

WRITE FOR DETAILS TO

X — Y ENTERPRISES P.O. BOX 796
HUNTSVILLE, ALA. 35804 / 337







# PAGE FOR PAGE **KILOBAUD** MICROCOMPUTING OFFERS YOU MORE.

Go ahead, count them . . . Kilobaud Microcomputing has more pages of articles each month than any other computer magazine. Articles that keep you in touch with the industry whether you're a rank beginner or an advanced hobbyist.

By reading the articles in Kilobaud Microcomputing you'll get to understand how computers work, how they can save you money in your business, what systems will be best for you, how the various programming languages work, what is new in both equipment and programs . . . and you'll learn how to write your own programs. You'll find hundreds of dollars of computer programs listed in the magazine . . . programs you can use for business and entertainment . . . or education.

Subscribe to Kilobaud Microcomputing today . . . with more articles (and better articles) than any other microcomputing journal, page for page you get more for your money.

OK—Sign me up fo  New Subscriber Renewal 1 yr./\$25.00 2 yrs./\$38.00 Payment enclosed Bill: Me	
Card#	Expire Date
Signature	Interbank #
Name	
Address	
City	StateZip
Canadian—\$27.00 for 1 year only in US funds. Fore PO Box 997	Farmingdale NY 11737  Please allow 6–8 weeks for delayed by 11737

# EXATRON STRINGY/FLOPPY Duners Association Newsletter

Secretary, Fred Waters

Readers will recall that last month in this newsletter we announced the advent of the Exatron Stringy/Floppy for the PET. Did YOU feel left out? Well....

## THE APPLE ES/F IS HERE!!

The Exatron Stringy/Floppy-ES/F for short-is a mass storage subsystem for microcomputers. It does what an audio cassette machine does, but with very high reliability, and high speed. It does what a floppy disk subsystem does, a little slower and is half the cost. It's a way to store all your programs, both BASIC and machine language, quickly and surely, ready to load back into memory in a few seconds when needed. It has its own operating system, and is a superior way to handle the storage for your word processing tasks, software systems development projects, and data files for data processing routines. Seeing one of these remarkable microperipherals in action will convince you!

#### WHERE DID IT COME FROM?

The Apple ES/F has a good pedigree. The Stringy/Floppy was introduced at the 2d West Coast Computer Faire in February 1978, for the S-100 bus. Later that year the ES/F for the SS-50 bus and the 6800 was perfected. In May 1979 the first ES/F for the TRS-80 was introduced at the 4th West Coast Computer Faire. Early in 1980 the ES/F with the RS-232 interface was on the market, followed by one for the PET. Exatron has been manufacturing handlers and test equipment for the electronics industry for many years, and brings those high standards to the development and manufacture of the Stringy/Floppy.

#### WHAT DOES IT CONSIST OF?

The Apple ES/F consists of everything you need: a Drive Module, a Controller Card to insert in one of the Apple card

slots, a flat ribbon cable connecting the two, and miniature tape cartridges called wafers. The Drive Module is housed in an attractive case to match your Apple: inside are the drive motor. the read and write tape heads, the read/write electronics, and operating controls for tape positioning and write protection. On the front face are the drive slot where you insert the wafer for SAVE or LOAD, and two indicator LEDs. The Controller Card contains the interface electronics for the Apple, and a ROM holding a bootstrap loader to load in the programs which make up the Stringy Operating System-SOS for short.

The Stringy/Floppy is physically integrated into your Apple II or Apple II Plus simply by inserting the ES/F Card into one of the card slots. It uses very little power, all of which is provided by the Apple bus.

The wafers are small tape cartridges 68mm x 40mm-two thirds the size of a business card -and 4.5mm thick. Inside is a continuous loop of digital quality tape in varying lengths from 5 feet to 75 feet providing different storage capacities. The wafer case is entirely enclosed except for a small slot where the drive capstan fits and another for contact with the tape head, for protection from handling and foreign particles. With each ES/F comes one wafer with SOS on tape, and a number of blank wafers for you to SAVE programs on.

The initial configuration has one Controller Card and one Drive Module. However the Controller will operate two Drives—all you do is connect the second unit. You can add as many Controller Cards as you have slots for—each one will allow two more drives.

#### WHAT WILL IT DO?

When the SOS (Stringy Operating System) is loaded into Apple memory by the bootstrap loader in ROM, it integrates itself into your BASIC—whether Integer or Applesoft—and returns you to the BASIC prompt.

You now have everything you had before in the way of BASIC commands, statements, and operation, with the addition of the complete SOS and all the ES/F commands. The ES/F commands will SAVE, LOAD, and RUN (load with autostart) programs in BASIC (either one or both); they will SAVE, LOAD, and RUN programs or data in binary (machine code); they will select either BASIC as desired when you have both in your Apple; and one command, CATALOG, displays a complete directory of the contents of a wafer.

The directory shows the position of each file on tape, the file type (Applesoft, Integer, or Binary), the starting address, the length of the file in bytes, and the file name. The SAVE commands include optional parameters for slot number, drive number, file position, and VERI-FY. With VERIFY, SOS will SAVE the file with the necessary parameters, and then run the tape around the continuous loop and compare the file just SAVEd against memory. When you SAVE your programs this way, you KNOW you have them right on the wafer! File names can be up to 30 alphanumeric characters-you don't have to correlate numbers and names separately.

#### HOW WELL DOES IT DO IT?

Here are some of the features, and what they will do for you. You're already familiar with the seemingly interminable delays in loading a program from audio cassette. The Apple ES/F saves and loads program material at 16,000 baud, or roughly 2K bytes per second. Tape speed is 10 inches per second. This means that you can save 10K bytes on the 5-foot wafer, and the ES/F will save and load this much material in six seconds!

What about reliability? Well, once you have certified a new wafer, it has a life expectancy of at least 10,000 passes. The error rate is so low that you may use the ES/F for weeks without ever running into a read or write error. There is a write-protect

feature built into the ES/F to help you avoid operating errors.

Since the ES/F was designed from the ground up to digital standards for use with industrial quality equipment, you are not handcuffed to using audio equipment, audio materials, or audio standards for your Apple. There are no buttons, knobs, or switches to adjust when you save or load programs. The operations are all controlled by the software, and are highly reliable.

## WHY DO YOU NEED TWO DISKS?

Did you read Stutsman's article on page 84 of Microcomputing for August? It's titled "Why Do You Need Two Disks?" Stutsman may never have tried out a Stringy/Floppy, but he puts forth some of the best arguments I've ever heard on why YOU need an ES/F. He wonders why (to paraphrase somewhat) we'd want to buy solutions to problems we've never had, and probably never will have. If vou're not satisfied with audio cassette standards for your highquality computer, but don't have the money to spend on one or two disks, check out the Exatron Stringy/Floppy. It meets Stutsman's suggested minimum standards for a good DOS, and will speak for itself when you try it

#### PRICES AND ORDERING

The ES/F is assembled and tested at the factory, with a 30-day money back guarantee and a one year full warranty. For fastest delivery, phone in your credit card or COD order using the toll-free line below.

Base price for the TRS-80 ES/F, \$249.50 (ask about the Starter Kit); for the S-100 ES/F, \$289.50; Apple and PET with single drive is \$299.50, dual drive is \$449.50

Info packets at no charge; users manuals for the TRS-80 ES/F are available for \$3.00 for shipping.

Handling is extra.

HOT LINE

WITHIN CALIFORNIA

800-538-8559

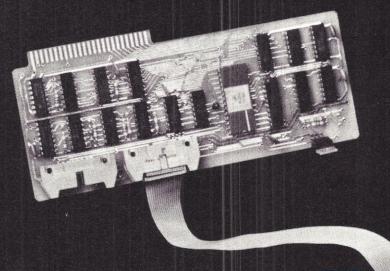
408-737-7111

If you have any questions about these products, about Exatron or about ES/FOA call the Hot Line. Address letters to ES/FOA, 181 Commercial Avenue, Sunnyvale, CA 94086.

Stringy/Floppy is a trademark of Exatron Corporation.

# FINALLY

AN ALTERNATIVE TO DISKS
THE EXATRON STRINGY FLOPPY
(MASS STORAGE SUBSYSTEM)
LOW COST - RELIABILITY - SPEED



INFORMATION PACKAGES AVAILABLE NOW FOR:

APPLE
PET
TRS-80
OSI
KIM/SYM/AIM
S-100
RS-232
STD-BUS
OEM





\$299.50

CALL OUR HOT LINE TODAY 800-538-8559

TO REQUEST AN INFORMATION PACKAGE

EXATRON, INC. ■ 181 COMMERCIAL STREET ■ SUNNYVALE, CA 94086

## **Area Estimation**

#### It's simply a matter of BASIC geometry.

```
100 REM MAIN PROGRAM -- MUST SPECIFY X AND Y COORDINATES PRIOR TO
110 REM EACH CALL. SETTING FLAG F TO 1 RESETS ROUTINE. STOP INPUT BY
120 REM ENTERING NEGATIVE NUMBERS.
130 F=1
140 PRINT "ENTER THE X AND Y COORDINATES ? ";
150 INPUT X,Y
160 IF X<0 OR Y<0 THEN 190
170 GOSUB 500
180 GO TO 150
190 PRINT "THE AREA IS "; A
200 END
450 REM
460 REM AREA COMPUTATION SUBROUTINE. X1, Y1 SAVE COORDINATES FOR
470 REM NEXT CALL. A IS AREA. B KEEPS SUBTOTAL. F=1 INDICATES TO
480 REM PROCESS ON FIRST CALL. XO, YO SAVE FIRST POINT COORDINATES.
490 REM F=0 RESETS FLAG.
500 IF F=1 THEN 570
510 A=B+X1*Y-Y1*X
                                    RUN
520 X1=X
                                    ENTER THE X AND Y COORDINATES ? 0 0
530 Y1=Y
                                    2 3
540 B=A
550 A=- (A+X*Y0-X0*Y)*0.5
                                    2.6666 4
560 RETURN
                                    4 6
570 X1=X
                                    5.3333 4
580 Y1=Y
                                    8 4
590 B=0
                                    6 3
600 A=0
                                    8 0
610 X0=X
                                    4 2
620 YO=Y
                                    -1 -1
630 F=0
                                    THE AREA IS 18.6667
640 RETURN
                                     Program A sample run (corresponds to
 Program A (for a Tektronix 4051).
                                     Fig. 1).
```

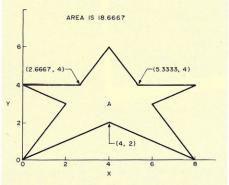


Fig. 1. Example of irregular figure whose area is estimated by Program A.

Arnold W. Bragg 409 Cedar Hill Lane Raleigh, NC 27609

n educated guess is often the best we can do when calculating the area of complex and irregular geometric shapes. While the area can sometimes be estimated by subdividing the figure into a mosaic of rectangles, triangles and circles, this

piecemeal technique is unsuitable for complex figures, and often lacks the precision required in sophisticated applications. A more precise computational tool is needed, one that will suit both the engineer and the hobbyist.

The area estimation software described here can calculate areas under function curves and areas of machine-generated figures, map sections, floor plans, survey plats and aerial photograph segments. Students can use the software routine to check geometry and integral calculus computations, or compute the surface area of butterfly wings and flower petals.

The software has been designed with three criteria in mind. First, the area computation algorithm must be a distinct module that does not require modification as the application changes. Second, the algorithm must be designed to run on machines having 4K of memory. Finally, the resulting area estimate must be mathematically correct. Compliance with these features guarantees the algorithm's suitability over a wide spectrum of users, machines and applications.

To estimate the area of any irregular shape we need only furnish the algorithm with the x- and y- coordinates of an arbitrary number of points lying on the figure's perimeter. The more data points we furnish, the better our estimate becomes. Because we are approximating curved segments with tiny straight line segments, the density of our data points should reflect the curvature of the perimeter.

At this stage we impose the algorithm's only restriction: We must traverse the figure in a clockwise manner. This guarantees that the area of the figure has the correct sign. The restriction assures us of mathematical correctness, which will be important later when we consider areas above and below an axis baseline.

RUN ENTER INITIAL X VALUE ? 0 ENTER FINAL X VALUE ? 2 ENTER INCREMENT OF X ? 1 THE AREA IS 4

RUN ENTER INITIAL X VALUE ? 0 ENTER FINAL X VALUE ? 2 ENTER INCREMENT OF X ? 0.1 THE AREA IS 3.34

RUN ENTER INITIAL X VALUE ? 0 ENTER FINAL X VALUE ? 2 ENTER INCREMENT OF X ? 0.01 THE AREA IS 3.3334

RUN ENTER INITIAL X VALUE ? 0 ENTER FINAL X VALUE ? 2 ENTER INCREMENT OF X ? 0.001 THE AREA IS 3.33333399999

Program B sample run 1 (corresponds to Fig. 2).

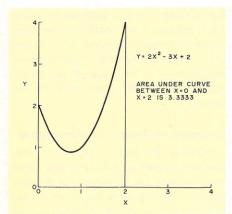


Fig. 2. Example of bounded area estimated by sample run 1 of Program B.

#### The Algorithm

Because the area estimation algorithm is suited to different applications, it has been incorporated into a subroutine that can be appended to a user's BASIC program as needed. The subroutine requires only three values at each call: the data point's x-coordinate, its y-coordinate and a status variable, or flag, whose value must be set by the user prior to the first subroutine call.

The subroutine computes the area of a polygon whose vertices (corners) are the data points entered so far. For example, after three subroutine calls, the algorithm has calculated the area of the triangle whose vertices are the three data points supplied with each call. The area is zero after the first and second calls because polygons with one or two vertices enclose no area.

Program A illustrates how to calculate the area of the flattened star of Fig. 1. Each vertex (corner) of the star represents a data

```
200 F=1
210 X=I
220 Y=0
230 GOSUB 500
240 Y=2*X*X-3*X+2
250 GOSUB 500
260 X=X+K
270 IF X<=J THEN 240
280 X=J
290 Y=0
300 GOSUB 500
310 PRINT "THE AREA IS "; A
320 END
450 REM
460 REM AREA COMPUTATION SUBROUTINE. X1, Y1 SAVE COORDINATES FOR
470 REM NEXT CALL. A IS AREA. B KEEPS SUBTOTAL. F=1 INDICATES TO
480 REM PROCESS ON FIRST CALL. XO, YO SAVE FIRST POINT COORDINATES.
490 REM F=0 RESETS FLAG.
500 IF F=1 THEN 570
510 A=B+X1*Y-Y1*X
520 X1=X
530 Y1=Y
540 B=A
550 A=- (A+X*Y0-X0*Y)*0.5
560 RETURN
570 X1=X
580 Y1=Y
590 B=0
600 A=0
610 X0=X
620 YO=Y
630 F=0
640 RETURN
```

Program B.

point supplied to the subroutine (lines 450-640) by an INPUT statement in the main program (lines 100-200). Our sign restriction forces us to traverse the star in a clockwise manner. Otherwise the area would be of the correct magnitude but would have a negative sign. We halt the routine by entering a negative X or Y value.

Variable F is the status flag, which is set to 1 in line 130 to indicate a first call. F is tested in line 500 for first call and reset in line 630 of the subroutine to zero for subsequent calls.

Variables X and Y represent the x- and y-coordinates of the most recently entered data point, and are supplied by the main program before each call.

Variables X0 and Y0 save the coordinates of the first data point for later processing. These values essentially allow us to "close the box."

Variables X1 and Y1 are the coordinates of the next-to-last data point entered. Variable B keeps a running subtotal of the area, and variable A is the area of the polygon defined by the data points.

RUN ENTER INITIAL X VALUE ? 2 ENTER FINAL X VALUE ? 8 ENTER INCREMENT OF X ? 1 THE AREA IS -41.75

100 REM MAIN PROGRAM - FUNCTION PROCESSING - LINE 240 DEFINES FUNCTION

110 REM AND I, J ARE BOUNDS ON X, K IS X INCREMENT SIZE, X AND Y ARE

120 REM CALCULATED PRIOR TO EACH CALL.

130 PRINT "ENTER INITIAL X VALUE ? ";

150 PRINT "ENTER FINAL X VALUE ? ";

180 PRINT "ENTER INCREMENT OF X ? ";

140 INPUT I

160 INPUT J

190 INPUT K

RUN ENTER INITIAL X VALUE ? 2 ENTER FINAL X VALUE ? 8 ENTER INCREMENT OF X ? 0.1 THE AREA IS -41.9975

RUN ENTER INITIAL X VALUE ? 2 ENTER FINAL X VALUE ? 8 ENTER INCREMENT OF X ? 0.01 THE AREA IS -41.999975

RUN ENTER INITIAL X VALUE ? 2 ENTER FINAL X VALUE ? 8 ENTER INCREMENT OF X ? 0.001 THE AREA IS -41.9999997499

Program B sample run 2 (corresponds to Fig. 3).

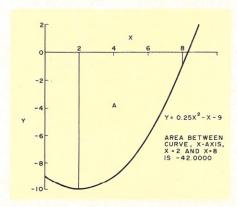


Fig. 3. Example of negative bounded area estimated by sample run 2 of Program B.

#### Calculating the Areas under Function Curves

Let's consider several examples. If we wish to compute the area under a function curve between two distinct points (Fig. 2) and we don't know the equation of the function we are dealing with, we use the approach outlined in Program A. We plot the function, estimate the x- and y-coordinates of a reasonable number of data points and supply these in sequence to the subroutine.

Generally, the more points estimated, the better our area estimate becomes.

If we know the equation of the function, we need only a simple routine to specify the beginning and ending X values and to incrementally calculate and pass x- and y-coordinates to the subroutine. Consider the equation  $Y = 2X^2 - 3X + 2$  between X = 0 and X = 2 (Fig. 2). Program B defines the main procedure and illustrates how the area estimate approaches the true area as

```
the magnitude of the X increment is decreased. We must specify the starting point on the X axis (X = 0, Y = 0) and call the subroutine. Our program increases X by some increment, calculates the corresponding Y value, then passes these new coordinates to the subroutine. When X has been incremented to 2 (the right bound), we drop to the x-axis and define the last point (X = 2, Y = 0). We conclude by calling the subroutine for the last time and displaying the estimated area.
```

Lines 130-190 of Program B request the left and right bounds and the X increment. Line 240 defines the functional equation and line 270 tests for the right bound of X. Line 310 displays the resulting area estimate.

If a segment of the function lies below the x-axis, then the area estimate of that segment has a negative value. Consider the equation  $Y=0.25X^2-X-9$  between X=2 and X=8 (Fig. 3). Changing line 240 of Program B to Y=.25\*X\*X-X-9 produces the estimates of Sample run 2. If we processed the function of Fig. 3 between X=2 and X=12.955 with a very small increment size, our estimate would approach zero; the area of the segment above the X axis is approximately equal to the (negative) area of the segment below the X axis, and the two cancel.

#### Calibrating the Areas of Irregular Figures

Consider the map in Fig. 4. We can estimate its area by selecting data points and supplying the coordinates of the sample points to Program A. But our set of axes has no grid as in Fig. 1. How can we estimate the X and Y coordinates? In what sort of units will our result be?

We obtain the coordinates of the data points by digitizing the outline of the figure. The digitization process can be accomplished by using a digitizing tablet or an optical scanner, or by overlaying the map with a sheet of ruled graphing paper

```
100 REM MAIN PROGRAM -- LINES 140-200 COMPRISE CALIBRATION MODULE, LINES
110 REM 210-290 COMPUTE AREA OF SEGMENT, ADJUSTMENT FOR CALIBRATION
120 REM FACTOR IS MADE IN LINE 270. R IS CALIBRATION UNIT AREA.
130 F=1
140 PRINT "ENTER THE X AND Y COORDINATES FOR CALIBRATION FIGURE ? ":
150 INPUT X, Y
160 IF X<0 OR Y<0 THEN 190
170 GOSUB 500
180 GO TO 150
190 R=A
200 PRINT "THE AREA OF THE CALIBRATION FIGURE IS "; A
210 F=1
220 PRINT "ENTER THE X AND Y COORDINATES ? ";
230 INPUT X,Y
240 IF X<0 OR Y<0 THEN 270
250 GOSUB 500
260 GO TO 230
270 A=A/R
280 PRINT "THE CALIBRATED AREA IS "; A; "UNITS"
290 END
470 REM NEXT CALL. A IS AREA. B KEEPS SUBTOTAL.
                                                    F=1 INDICATES TO
480 REM PROCESS ON FIRST CALL. XO, YO SAVE FIRST POINT COORDINATES.
490 REM F=0 RESETS FLAG.
500 IF F=1 THEN 570
510 A=B+X1*Y-Y1*X
520 X1=X
530 Y1=Y
540 B=A
550 A=- (A+X*Y0-X0*Y) *0.5
560 RETURN
570 X1=X
580 Y1=Y
590 B=0
600 A=0
610 X0=X
620 Y0=Y
630 F=0
640 RETURN
                                Program C.
```

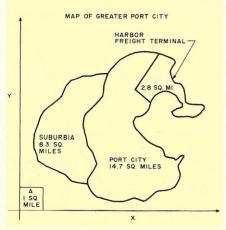


Fig. 4. Example of calibrated area estimated by Program C.

```
RUN
ENTER THE X AND Y COORDINATES FOR CALIBRATION FIGURE ? 0 0
0 5
5 5 5
5 0
-1 -1
THE AREA OF THE CALIBRATION FIGURE IS 25
ENTER THE X AND Y COORDINATES ? 5 10
4 11
3.5 12
. . . .
10 6
9 6.5
6 8.7
-1 -1
THE CALIBRATED AREA IS 8.25017 UNITS

Program C sample run (corresponds to Fig. 4).
```

and reading the coordinates directly. Then, by defining a unit of known area (for example, box A of Fig. 4 = 1 square mile) and dividing our final result by this calibration factor, we guarantee that our results are independent of the coordinate scaling factor or grid size chosen, and are also expressed in terms of the units measured (in this case square miles). Program C illustrates how the calibration program estimates the area of the SUBURBIA subsector of Fig. 4. Notice that the calibration module uses the area subroutine to calculate correction factor R (line 130-200).

As indicated in Programs A, B and C, the area estimation subroutine is suited to several different applications, and requires only a small amount of memory for implementation. Applications differ only in the method by which data points are selected. The selection methods alter the calling routine; the subroutine never needs to be modified.

Program A is used when a convenient grid scale exists and data points with nonnegative coordinates can be read directly from the scale, traversing clockwise. Program B is suited for numerical integration applications between specific bounds. Area segments below the x-axis display the correct sign. Program C is useful when the area estimate must be expressed in standard or non-standard units such as square inches or acres rather than in terms of the unit imposed by the grid scale.

In each case, our accuracy depends only on the number of sample data points we select to reasonably represent the figure and the precision with which the x- and y-coordinates of these data points are estimated.



#### SOFTSTUFF.

Affordable Software Tools established by Heath Company, offers you a selection of software tools at affordable prices.
All SOFTSTUFF programs have been checked and confirmed on the hardware indicated. Documentation, though not as extensive as standard Heath Company documentation, has been completely reviewed and judged acceptable. All SOFTSTUFF products come on a 51/4-inch diskette and require HDOS, unless otherwise stated. For value and performance ...SOFTSTUFF is good stuff.

General Ledger II

Includes powerful programs for entry, maintenance, reporting and analysis of accounting data. Features include: Custom Chart of Accounts for determining account names and numbers. Any numbering system may be used, with or without decimal notation. Comprehensive Printouts upon request. Printouts of Chart of Accounts/ Trial Balance/Worksheet, Journal, General Ledger, Income Statement, and Balance Sheet. Simple-to-use formatting program lets you customize headings, subtotals, and totals for the Income Statement and Balance Sheets. Statements include common-form analysis of amounts. They also include variances from budget or prior year figures (your choice), expressed in dollars and percentages. All printouts require 96-column capacity. Double Entry/Automatic Entry Checking automatically checks equality of debits and credits with each entry. Non-equal transactions are rejected. Simple Data Entry, with one quick keystroke, in General Journal, Cash Receipts, or Cash Disbursements mode. Account Verification helps guard against mistakes by preventing entries to non-existent accounts and rejecting account numbers already in use. New Account Facility lets you open new accounts any time during data entry with no disruption to the transaction being entered.

Balance Reporting lets you call the balance of any account to the terminal during data entry. All balances are instantaneously updated with entry of new transactions. Audit Trail provides provision for a source document number (such as a check, receipt or invoice number) and for a brief free-form description of the transaction. One of the easiestto-use, most flexible systems you'll find anywhere.

Along with diskette and user's manual, General Ledger II includes sample printouts and program listings. Requires Microsoft BASIC.

HDOS Model #SF-9004: \$124.95. CP/M Model #SF-9104: \$124.95 (8" disk). Manual only, Model #595-2500: \$15.00 (refunded when complete package is purchased).

#### Full Screen Editor:

The SOFTSTUFF text editor uses H89 or H19 screen as a window into a file. Cursor motion keys position the cursor so changes can be typed anywhere on the screen. Function keys perform character and line insert and delete, string search, move and copy single and multiple lines, and scrolling of text in the window. For H89 and H8 + H19. **HD0S Model** #SF-9000: \$49.95.

#### Text Formatter:

Performs fill and justification (straight right margins) of text previously prepared by your editor. Page numbering, headers and footers, indents, hanging indents, centering and underlining. *INCLUSION* feature allows automatic insertion of up to 26 user defined strings and merging of documents. HDOS/H19/H89. HDOS Model #\$F-9001: \$54.95.

#### Microsoft Macro 80:

8080/Z80 MACRO Assembler. Intel and Zilog Mnemonics supported. Relocatable linkable output. Package includes LINK 80 and Cross Reference List utilities. Complete documentation and HDOS common deck MACRO included. For H8 and H89. **HDOS Model** #SF-8002: \$69.95.

A utility which provides file transfer between the H89 and H8/H19/H17 and Information Services (MicroNET). Features include user defined keys which provide for auto-login, mail check, etc. Full error checking and elapsed time clock on screen. Very easy to use. Use on other time sharing systems too. HDOS Model #SF-9003: \$39.95.

#### SORT:

An extremely fast assembly language routine that sorts records up to 255 characters in length with user defined sort fields. Could be called by MBASIC or stand-alone. Source code provided. HDOS Model #SF-8004: \$29.95.

#### Small Business Inventory

For complete inventory analysis. Accommodates up to 12-character part numbers (alphanumeric), 18-character descriptions of parts, 12 items of information on each part include reorder level, usage history by month and year-to-date, much more. Printouts include: (1) all information, (2) part #, description, price, (3) reorder list. Requires Microsoft BASIC and H19 terminal. HDOS Model #SF-9005: \$69.95.

#### To order:

- 1. Send check or money order to Heath Company, Dept. 351-708, Benton Harbor, MI 49022. Michigan residents add 4% sales tax. Write model numbers clearly.
- Call toll-free 800-253-0570 and use VISA or Master Card. In Michigan, Alaska, & Hawaii, call (616) 982-3411.
- 3. Visit your Heathkit Electronic Center where SOFTSTUFF is on display. See your telephone white pages for the location nearest you.

SOFTSTUFF is a trademark of Heath Company.



SF-102

# SERIOUS READING

#### The Personal CHORGANIZER

Are you thinking about owning a personal computer but the thought of having to learn a lot of sounding words turn you off? Wish people could talk and write in plain English? Well, behold the Charganizer. This book discusses just what most people expect a computer to do for them. It shows how to remove the drudgery from common chores. How? Through high-speed organization techniques — the very thing a computer is well suited to do. The Chorganizer will help you to learn how to save money, plan better, locate important facts quickly. This can lead to a better life-style for you. It will free you from laborious chores. What kind of chores, you wonder? Just to name a few, a computer can help you balance your checkbook, maintain a list of household valuables for inventory and insurance claim purposes, keep a list of monthly department store charges, record taxdeductible expenses by category for income tax purposes, and mail cards, invitations or notices to friends, members of a club, business associates, etc. Using a few simple commands and statements, and a data-base management program on your personal computer and your time can be spent on life's pleasures instead of day-to-day chores.

Only \$5.95 No. 87

## SCELBI's Secret Guide to Computers

This book will turn you into a computer expert, quickly and easily. It explains the kind of computer found in most schools, small businesses and homes — the kind that has interactive BASIC. You'll learn BASIC, having fun every step of the way. The book explains how to deal with computer machinery, which buttons to press and trains you to write many kinds of programs. The author's "underground" style of writing is sure to hold your interest. The only way to learn BASIC programming is to look at sample programs, analyze them, and then invent your own. This book contains 150 sample programs that do just that. Charts are given comparing the different computers. Follow the four "secret" lessons of this book and you'll be programming a computer with confidence!

Just \$5.95 No. 93

#### **Z80** Instruction Handbook

Your complete guide to the powerful Z80 instruction set. Machine codes are presented in both octal and hexadecimal format. A convenient index lists all instructions alphabetically along with machine codes and timing information. Industry standard memonics used throughout. Convenient pocket-sized edition.

Only \$5.95 No. 20

## Introduction to Low Resolution GRAPHICS

What is "low resolution graphics"? It's graphics presented on a point-by-point basis where the number opoints is limited to about 8000 or less. The APPLE II, TRS-80 and PET all have this capability and this publication will enable you to utilize your computer to the fullest. Consolidate data through graphics. Plot plain and simple, or fancy and complex, graphs for business. A computer presentation can improve impact by clarifying and amplifying the substance of the materials at hand. But if your interests lean more toward just having fun, this book will quickly show you the way. Learn to produce amazing computer graphics—even if you can't draw a line, literally! Master the basics of line & shapes, then on to drawing pictures, even creating animations! Produce a deck of playing cards... a clown that winks... or if you feel really inventive, try your hand at meshing your favorite illustration with synchronized, computer-generated sound. A new opportunity in programming awaits you — invest in Introduction to Low Resolution Graphics.

Just \$11.95 No. 65

## Software Cookbooks - 6502, 6800, 8080, Z80

With the right SCELBI Gourmet Guide & Cookbook, you'll be able to put together programs without having to start from scratch. You'll have the most useful routines at your command — already programmed and ready-to-use. Features are search and sort routines, numerous examples of general-purpose utility routines, I/O and interrupt programming, control and manipulation of stacks, code and numeric conversion routines, flowcharts and source listings. Special listings include a presentation of machine codes (hexadecimal and octal notation included), and a reference guide to complete instruction set. All recipes are time tested. Tens of thousands of SCELBI's cookbooks have been used throughout the U.S. and in countries around the world. No. 99 (6602) \$12.95; No. 50 (6800) \$12.95

No. 60 (8080) \$12.95; No. 75 (Z80) \$15.95

#### Learn Micro-Computers

A new multimedia information package for the beginner. Includes text from *Understanding Microcomputers* plus high-quality cassette. Covers all the basics quickly, easily and enjoyably. Companion tape includes chapter-by-chapter synopsis of the book. A great new idea for self-study.

Just \$14.95 No. 40

#### Take My Computer . . . Please!

An uproariously funny full length book about the true-to-life misadventures of well-known author Steve Ciarcia and his computer's inability to cooperate. Page after page of jollies and illustrations, too! Hardcover edition.

Just \$5.95 No. 35

#### Personal Information Management System

Increase your information management capabilities—use PIMSI In business you've got a personal stake in how information is managed because information is your key to success. PIMS will allow you to unleash the power of a microcomputer, to make it work for you! Use your computer for accounts receivable . . . accounts payable . . . maintenance of inventory records . . . to keep track of credit charges. Or, apply PIMS to personal chores and let it help you to improve your ability to plan . . . save money . . . locate important facts quickly. Specifics such as management of income tax deductions, department store charges, keeping track of personal disbursements, and more, can be managed through your computer. Let PIMS introduce you to a new way of living . . . enjoy a better life style, more happiness and freedom from drudgery of routine chores through the better command of information that PIMS can bring your way. Designed for computers such as the TRS-80, PET, etc., PIMS will give you the power to succeed in either the professional or personal arena, even without prior knowledge of programming. Easy-to-read manual and source listing included. Success is only as far away as your copy of PIMS!

#### **Understanding Microcomputers**

If a basic understanding of microcomputer language has now become a necessity, help is here. Understanding Microcomputers offers its readers an education in microcomputer system information. The easy-to-read format assures quick comprehension or both the neophyte as well as the professional searching for business applications. This 300-page publication tells how to select a small computer system, introduces BASIC language programming, and illustrates BASIC instructions for almost every class of microprocessor. The convenient glossary covers all key terms.

Only \$9.95 No. 90

#### Calculating with BASIC

Here's a variety of programs in BASIC language to help the businessman, scientists and engineer. Shows how to apply the language to practical problems and equations. Formulas cover calculations of interest, payback periods, mortgage schedules, techniques for extending number of useful digits in monetary calculations using limited BASICs. A variety of electronicapplied formulas are programmed. The mechanics chapter covers resultant-force calculations, attractive forces due to gravity, projectile motion prediction and graphing, moments of inertia for T-section, I-section and channel sections. Mathematics chapter includes programs to solve the quadratic formula, general summation formulas such as sum of geometric progression, number conversion program, algorithms to compute sine, cosine, tangent, log e. For fun, games of Hangman and Soace Capture are provided.

Only \$8.95 No. 30

#### Microcomputer Potpourri

A pocket-sized reference for the beginner. Data on all the popular chips. Pin connections, diagrams, distinguishing features. All the pertinent information is presented clearly and concisely. Also included is a glossary covering all the jargon. Full digest on understanding microcomputers.

Just \$3.95 No. 70

You'll appreciate a special quality of SCELBI books — A mark of excellence that's hard to find elsewhere. Books written authoritatively, yet in a style that is easy to read and with an appearance that makes reading them a pleasure. See SCELBI books at your favorite electronics or computer store or use this handy coupon and order direct. HP-85 users, ask about our new programs for that machine.

	Publication	281 pod, CT 06110
shipping/handling are for North An	charges for each nerican customers	Please include \$1 item. Prices shown . MC/VISA, Postal Allow 4 weeks for
□ No. 10	□ No. 20	□ No. 30
□ No. 35	□ No. 40	□ No. 50
□ No. 60	☐ No. 65	□ No. 70
□ No. 75	□ No. 87	□ No. 90
□ No. 93	□ No. 99	
Name (print).		
Address		
City/State		
Zip Code		
Card No		
Bank No	Am	nt. Enc
Signature		

## Thoughts on the **SWTP Computer System**

The author takes a closer look at the 6809 and its Motorola BASIC, discusses multiprogramming and presents two interrupt-driven printer programs.

Peter A. Stark PO Box 209 Mt. Kisco, NY 10549

Since my comments on the 6809 appeared in the January issue, several readers have chided me for urging caution. Perhaps I wasn't clear enough in my comments. Here's what I intended to say.

I'm impressed by the 6809. It's about the best microprocessor around. The fact that so many other manufacturers are planning computers using it-including the TRS-80 Color Computer-is testimony to the fact that others think it's great too.

But as of now, its capabilities are not being utilized. 6809 software as of last January was simply reassembled 6800 code. While this software runs faster on the 6809, it doesn't take full advantage of the 6809's potential. Thus, rushing to convert to the 6809 just didn't make sense, especially since it wasn't definite whether the approaches of several different companies active in the software and hardware areas would be compatible. Hence, my caution and somewhat negative article.

In the meantime, there has been frantic activity to develop the software to take advantage of the 6809's capabilities. Moreover, what started out as bedlam - with each manufacturer heading off in a different direction - is now being coordinated, with most of the SS-50 bus manufacterers keeping in contact and exchanging hardware and software to make sure their products are compatible. That is a welcome sign.

#### Motorola's BASIC-09

One of the most important developments is a new BASIC from Motorola. As you remember, the 6800 received a bad and undeserved reputation for being slow simply because the first 6800 BASICs were slow (though excellent in other respects). It makes you wonder where the 6800 would be with respect to the 8080 and Z-80 had Motorola initially spent the money to develop an excellent BASIC, which they are now developing for the 6809.

For over a year, Motorola has had a contract with Microware to develop a new BASIC called BASIC-09. A preliminary version was on display at the Gimix booth at the West Coast Computer Faire in March and caused quite a stir. I've read the preliminary manual and hope to have a chance to try it out soon for a more complete report. But the manual is amazing.

BASIC-09, a structured language, borrows some of the better features of Pascal. Line numbers are optional; the program is broken up into sections called procedures, with each having a name. Procedures then call each other by name. Line numbers, if used, as well as variables, are local to the procedure, so other procedures can use the same line numbers or variables. If you're into structured programming, then you'll like this BASIC; if not, then just ignore procedures and write the whole program as one big procedure.

BASIC-09 has five types of variables - byte, integers (up to 32,767), real (nine-digit precision using 40-bit floating point binary), Boolean (true-false) and string (with string length up to 32,768 characters). You can define your own data formats by combining these five data types into larger data structures.

For BASIC old-timers, BASIC-09 has the standard GOTO statement; for structured programming aficionados who don't like GOTO, there are also

IF...THEN...ELSE REPEAT...UNTIL WHILE...DO

and other structures in Pascal.

BASIC-09 is a semi-compiler like the new TSC BASIC; that is, as each line is typed in. it is immediately checked for accuracy and translated into an internal code that makes later execution faster. When the program is listed, it is translated into plain BASIC and printed in an indented form for easy reading. BASIC-09 also includes an editor function that has extensive editing capabilities, including renumbering and string replacement. Variable names and

procedure names can be any length, upper

For debugging, BASIC-09 allows tracing, which prints out each source line before it is executed, as well as the values of variables as they are assigned. At any point, the program can be suspended, and the variables can be read out or changed.

Microware has also developed an operating system called OS-IX (pronounced OS-nine). Although OS-IX is available with BASIC-09, it is also available separately from Microware. It is essentially a deviceindependent operating system that provides the interface between BASIC-09 or other languages and the hardware.

BASIC-09 will probably be available in ROM from Motorola as well as in disk-based versions directly from Microware.

For those users who want disk-based BASIC, Microware has signed a contract with Microsoft and will supply Microsoft BASIC 5.0, along with OS-IX, on disk. The advantage of this is that all the business software that now runs on other versions of Microsoft BASIC will also run with this BASIC. Present plans are to make this software compatible with both 5 inch and 8 inch floppy d'sks, as well as several different disk controllers.

At this point, it is still not definite as to what hardware will be required for what software. If you're happy with your 6800 system, stick with it until some more dust settles.

#### Time-Sharing and Multitasking

Most of us use our 6800 systems for just one job at a time. But the 6800 is versatile enough that it can execute several functions at one time. All of these require interrupts in one way or another.

The top eight locations in a 6800's memory, locations FFF8 through FFFF, contain four transfer vectors that correspond to the three interrupt inputs and reset as follows:

FFF8 and FFF9 - IRQ interrupt

FFFA and FFFB - SWI interrupt FFFC and FFFD - NMI interrupt

FFFE and FFFF - Reset

(Reset is not really an interrupt, but it

behaves in a similar way.)

When the RESET switch is pressed, for instance, the 6800 stops whatever it is doing, fetches the vector that is stored in locations FFFE and FFFF in ROM and executes a jump to the address that the vector points to. For instance, in SWTBUG or MIKBUG, locations FFFE and FFFF contain the number E0D0. Hence, pushing RESET will force the computer to execute a jump to location E0D0, which is the beginning of the

Interrupts act a little differently. When one of the two interrupt inputs to the 6800 (either IRQ or NMI) is grounded, or when the program encounters an SWI instruction, the 6800 also completes its current instruction and then jumps to wherever the corresponding vector in ROM is pointing. However, before that jump it stores the contents of its internal registers in the stack, Later, an RTI instruction will fetch all of the information back off the stack and allow the 6800 to resume running the program that had been interrupted as though nothing happened.

The three interrupt methods have different uses. The SWI instruction is usually used for debugging (we have already seen in this series how it can be used with breakpoints and single-stepping). It can also be used for subroutine calls. For instance,

GMXBUG uses the SWI to return to the monitor so that a system subroutine can be executed.

IRQ interrupts are usually used to allow I/O devices to call for help from the processor. An IRQ interrupt request (via a grounded IRQ pin) will be ignored by the 6800 if the I bit in the condition code register is a 1, so that important programs can turn on this bit and prevent IRQ interrupts from occurring.

This important feature is called masking. Certain kinds of programs - such as disk reads and writes, which have critical timing and would make errors if they were interrupted-can set the I bit and prevent themselves from being interrupted. Furthermore, once an interrupt occurs, further interrupts are usually masked to prevent some other problems.

NMI interrupts, on the other hand, are not controlled by the I bit in the condition code register; NMI stands for nonmaskable interrupt. When an NMI interrupt request occurs-when the NMI pin on the 6800 is grounded-an interrupt will occur, regardless of what else is going on.

Hence, NMI interrupts are usually reserved for important events, where the possible loss of data is not important. A typical case is a power-fail interrupt, where a sen-

sor in the power supply generates an NMI interrupt when power fails, with the idea of giving the 6800 a few milliseconds-until power supply capacitors discharge, perhaps - to stop executing a program and either save data or at least go into a failsafe mode before all power goes off.

Thus, for time-sharing or multitasking, we're usually concerned with the IRQ interrupt. IRQ interrupt requests can either come from an I/O device that asks for an interrupt when it needs the CPU or from an external timer that generates interrupts at fixed intervals

Why would you want to generate these timed interrupts? There are several possible reasons:

- 1. An interrupt routine could keep count of these interrupts and use them to keep track of the time and date, which could then be stored in some memory locations and read out by other programs. Such an approach was described in an article by Richard Parry in the January 1980 issue of Kilobaud Microcomputing on page 150. (Richard's scheme was a bit indirect: interrupts did not go to the 6800 directly, but went through a PIA first. But that's not important.)
- 2. A timed interrupt could be used to time external outputs. For instance, if we wanted



# COMPUCOVER® -\*\*





Dealer and Club Discounts Available

Overseas Orders Add \$3.00 For Postage

\$22.95

TRS-80 MODEL I
Keyboard \$7.95
Cassette 4.95
Video Display9.95*
Package Offer19.95*
*Note-Add \$3.00 for
EVDANGION INTED

TRS-80 MODEL II

Keyboard Only.....

ine Printer Line Printer II. Quick Printer I. 9.95 Full Apple II.. \$12.95

Apple II Keyboard......9.95

Apple II Disk.. Pet Computer. \$12:95 Pet 2022 Printer. ..9.95



Diab

Keyb

Cent

700, P1, 7

779

T.I. 8

Cloth Backed Naugalhyde Vinyl

Waterproof & Dustproof

Longer Life

Improved Reliability

 Two Decorator Colors Saddle Tan . Black

> Vector MZ. N. Star Horizon. Compucolor II... 19.95 OSL CAP .9.95 Sorcerer HAZELTINE 1400, 1410, 1500, 1510, 1520, 1552 \$18.95 Soroc IQ 120.. .18.95 Adds Terminal 25, 100, 980 etc. .19.95

TO ORDER: Include \$1.00 for Postage & Handling Send Check or Money Order To CompuCover

P.O. Box 324 Dept. A Mary Esther, FL 32569 Phone (904) 243-5793

A-314.95	Trendcom 100 & 2009.95	
0 1009.95	Decwriter III19.95	
	I.D.S. 44012.95	
Spinwriter	TRS-80 Disk\$4.95	
board Models\$15.95	Double Disk7.95	
olo Printers	Percom Disk4.95	
poard Models15.95	MPI B51, B524.95	
	Lobo Mini Disk6.95	
tronics Printers	Matchless Mini6.95	
701, 702, 703\$19.95	Vista Mini Disk6.95	
730, 7379.95	Superbrain19.95	
17.95	Intertube 19.95	
00 Series19.95	Emulator19.95	

to output serial five-level code out of one of the outputs of a PIA at 45 baud, then an interrupt occurring every 1/45 of a second could be used to time the outputs.

3. When we want to run several programs in a round-robin fashion, giving each a certain amount of time, an interrupt timer can cause the transfer of control from one program to the next. This is essentially the idea behind time-sharing. There are several 6800 products designed for running multiple programs in this fashion.

#### Microware's RT-68

Our discussion of monitors has already covered some of the features of the RT-68; let's look at just its multitasking operation.

With the RT-68, CPU time is allocated to each of up to 16 programs (called tasks) in a round-robin fashion, so that these tasks appear to run concurrently. These tasks may be independent or may depend on each other and share data.

RT-68 keeps track of these by maintaining a task status table in locations A050 through A07F. For each of the 16 possible tasks, the table contains three bytes of information. The first of these is a TSB, or task status byte, while the other two contain a TSP, or task stack pointer.

Tasks are started and stopped by inter-

rupts; since each interrupt stores register contents in the stack, each of the 16 tasks has to maintain its own stack area to keep this data separate from all other tasks. Thus, the task stack pointer in the table points to the stack used by each task. Keep in mind that of the 16 possible tasks, only one task is actually running at any one time; task stack pointers for the other 15 are constantly kept in the table.

Tasks can have one of three states:

- 1. Currently executing.
- 2. Active, that is, not currently running, but ready to run as soon as their turn comes.
- 3. Inactive, that is, not currently running and also not ready to run.

Although RT-68 can handle up to 16 tasks, in most cases a much smaller number of tasks will be active. There could, for instance, be just two active tasks and 14 inactive ones.

The task status byte is divided into three sections:

- 1. Bit 7 indicates whether the task is active (1) or inactive (0).
- 2. Bits 6 through 3 indicate how long that task is to run before being stopped and control turned over to another task. This time is measured in interrupts received from an interrupt timer; each interrupt is called a tick, and a task may be assigned from one to 15

ticks.

3. Bits 2 through 0 indicate a task's priority. Each task can be assigned a priority from 0 to 7. Higher-priority tasks get preference over low-priority tasks; in fact, a low-priority task will not run at all as long as there are active higher-priority tasks. There is also a system priority that RT-68 keeps for itself; tasks having a lower priority also don't get a chance to run.

RT-68 uses an external clock timer, which generates an interrupt at a fixed interval, such as every 1/60 or 1/100 second. This is coupled to a PIA on port 1, and through that to the NMI line. Thus, the clock generates an NMI interrupt at fixed intervals.

Normally, NMI interrupt requests cannot be masked, but RT-68 channels them through a PIA first so they can be controlled at the PIA. This converts them into a maskable form and also allows testing to see where an interrupt came from. Other interrupts can also be connected to the NMI or IRQ inputs. RT-68 can tell the difference between a clock interrupt and a user NMI interrupt by checking to see whether it came from the PIA on port 1.

#### Other Available Programs

Several programs for multi-programming with the MP-T timer are available from Ed

## OSI SOFTWARE FOR OSI We Have Over 100 High Quality Programs For Ohio Scientific Systems

#### ADVENTURES AND GAMES

Adventures - These interactive fantasies will fit in 8K! You give your computer plain english commands as you try to survive.

#### ESCAPE FROM MARS

You awaken in a spaceship on Mars. You're in trouble but exploring the nearby Martian city may save you.

#### DEATHSHIP

This is a cruise you won't forget - if you survive it!

Adventures \$14.95 Tape or 51/4" Disk \$15.95 8" Disk

\$15.95 8" Disk

STARFIGHTER \$5.95

Realtime space war with realistic weapons and a working instrument panel.

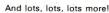
ALIEN INVADER 6.95 (7.95 for color and sound)
Rows of marching munching monsters march on

TIME TREK \$9.95

A real time Startrek with good graphics.

BATTLEPAC \$17.95

For the battlebuff. Contains Seawolfe, Starfighter, Bomber and Battlefleet.





#### TEXT EDITORS FOR ALL SYSTEMS!!

These programs allow the editing of basic program lines. All allow for insertion, deletion, and correction in the middle of already entered lines. No more retyping.

C1P CURSOR CONTROL (Text Editor) \$9.95

Takes 166 bytes of RAM and adds, besides text editing, one key instant screen clear.

#### C2P/C4P CURSOR \$9.95

Takes 366 BYTES to add PET like cursor functions. Enter or correct copy from any location on the screen.

SUPERDISK \$24.95 for 5" \$26.95 for 8"

Has a text editor for 65D plus a great new BEXEC\*, a renumberer, search, a variable table maker and Diskvu - lots of utility for the money.

We also have 25 data sheets available such as: IMPLEMENTING THE SECRET SOUND PORT ON

THE C1P \$4.00 HOW TO DO HIGH SPEED GRAPHICS IN BASIC

HOW TO READ A LINE OF MICROSOFT \$1.00

JOYSTICK INSTRUCTIONS AND PLANS FOR C1P \$3.00

SAVING DATA ON TAPE \$4.00

THE AARDVARK JOURNAL

A tutorial bimonthly journal of how to articles \$9.00

Our \$1.00 catalog contains a free program listing, programming hints, lists of PEEK and POKE locations and other stuff that OSI forgot to mention and lots more programs like Modem Drivers, Terminal Programs, and Business Stuff.

Aardvark Technical Services 1690 Bolton, Walled Lake, MI 48088 (313) 624-6316

19

Joyce, 4603 Lyceum Drive, San Antonio, TX 78229. His scheme also uses a task status table and some similar ideas.

If you have access to old copies of Electronic Design magazine, a short note by David Johnson in the February 15, 1978. issue describes a simple approach to do the same thing. In this case, switching back and forth between tasks is initiated by each task periodically suspending itself by calling the monitor. This approach is simpler but has the disadvantage that a program that develops a bug may not release control.

#### **SWTP Multi-User Board**

The approaches I've discussed so far are for running a number of completely separate programs; the multi-user board (MUB), on the other hand, is set up for running one program with several users. It's intended to allow up to four users to run programs in either the BASIC or Pilot language. Either way there is only one BASIC or Pilot interpreter in memory, and the four users take turns using it to interpret their own user programs.

The MUB board occupies memory addresses 0000 through 0FFF, or the lowest 4K. Thus, only addresses from 1000 and up are available for user RAM. SWTP states that the remaining memory from 1000 to 7FFF must be built up out of 4K and 8K boards and that the 32K memory board cannot be used with the MUB. This is not so, as we shall see later.

In any case, the MUB uses up addresses from 0000 through 0FFF, or 4K. On the board are four 2114 static RAMs, which provide 2K bytes of memory, which is split up into four 512-byte sections, one section for each user. As in a typical timesharing system, each user gets a small slice of time, typically about five milliseconds, during which his program runs and the other users' programs are dormant. During this time, his 512 bytes occupy addresses 0000 through 01FF, while the other three 512-byte memories are disconnected.

The MUB has a page register at address 0C00 that selects which of the four 512-byte memories is enabled at any one time. The variables, stack and various constants for each user are stored in these 512 bytes and swapped in and out by hardware when a different number is written into this page register to select a different user.

An interrupt timer on the board generates an IRQ interrupt about 200 times per second (about five milliseconds apart), so no external timer board is required. These interrupts are generated by a 555 timer, which is disabled when the system is first started but starts working when a read from location 0800 is executed. Once the clock starts, it continues running until power is turned off or the reset button is pressed.

The hardware of this board is fairly simple; it's the software that makes the whole operation useful. Normally supplied with the MUB is a 4K Micro BASIC Plus, which allows up to four users at the same time. This is an integer BASIC without strings that appears similar to the Micro BASIC offered by TSC. In fact, the multi-user board and multi-user BASIC first appeared in some TSC ads a few years ago.

Also available are 8K cassette and diskbased BASICs from SWTP. Using the information in the fifth installment of this series (September 1979), you could modify SWTP 8K BASIC, version 2.0, to work in this mode

Of special interest to teachers, though, may be the multi-user Pilot also available from SWTP and Micropi. Pilot is a programmed instruction language specially set up for easy programming of questionand-answer-type programs.

Basically, Pilot commands consist of one or two letters followed by a colon (T: or M:), followed, in turn, by some text, for example:

T: What's your name? M: Pete, Peter

YT: I like that name.

NT: Too bad

This program says to type (T:) the question, "What's your name?" wait for an answer (A:) and match that answer (M:) against either Pete or Peter. If it matches (YT: means type if yes), print one message; if it does not match (NT: means type if no), print another.

Full Pilot allows branching and computation, but the convenient feature is that it also will allow partial matches of answers or even allow alternative answers. For example, it will accept an answer even if it is misspelled or will accept a numeric answer to a problem even if it is off by a slight amount. Though BASIC could also be used for this type of programming, it takes a lot of work in BASIC to allow for alternative or partial answers.

#### **MUB Modifications**

Since the multi-user board occupies the lower 4K of memory but only has 512 bytes of actual memory accessible at any one time, when it is plugged in, the system will not run any other programs that require the lower 4K.

Moreover, SWTP states that the MUB board cannot be used with the 16K or 32K dynamic memory board. Thus, to get a full 28K of memory (from 1000 to 7FFF) you need three 8K boards and a 4K board. When you unplug the MUB board to run normal programs, you then need one more memory board to supply the lower 4K. Thus, to use the system you need five memory boards, a lot of power and almost \$1000 (at list price).

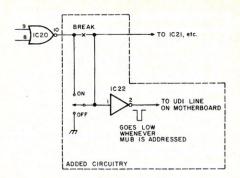


Fig. 1. Changes to multi-user board.

With a simple modification, the MUB will work just fine with the 32K memory board. Moreover, this modification includes a switch to enable or disable the MUB, so that the system can be used for standard singleuser programs without having to plug and unplug boards. As with some other information in previous installments, this modification comes from a knowledgeable SWTP dealer, Lehigh Computer Works, 1132-2 Tilghman Street, Allentown, PA 18102. Tom Quay of Lehigh has tried this one out and it works well. I'll only outline the mod here; complete details can be obtained from Lehigh.

The modification simply disables the 32K memory board whenever the MUB is addressed. The only specific requirement is that the memory board contain the full 32K of memory; this is really of no consequence because for multi-user applications you'd probably want this much memory anyway. The only parts required for the modification are some wire, an SPDT switch and a 2.2k resistor.

The switch is optional, but it does allow the MUB to be switched out, so that the full 32K of memory becomes usable for normal program use. This modification also uses the UD1 line on the motherboard; if your system is already using this line for some other purpose, then you'll have to find some other way to get a signal from the MUB to the memory board (such as a direct jumper).

Fig. 1 shows the changes required on the MUB board. The connection from IC20, pin 10, to the rest of the board must be broken by cutting a printed circuit land or simply by bending pin 10 up and out of its socket, if an IC socket is used. The SPDT switch should be mounted on the upper left corner of the board and connected as shown in Fig. 1. IC22 has an unused inverter, which feeds the UD1 line on the bus. This signal goes low whenever the MUB is addressed.

Fig. 2 shows the changes to the 32K memory board. Jumpers E1 and E2 should be removed and a 2.2k resistor connected instead of E2. This would therefore permanently enable the board for the full 32K of memory from 0000 to 7FFF. But a wire from UD1 up to pin 2 of U42 as shown



		The second second
WK-7	COMPLETE IC INSERTER/EXTRACTOR KIT	\$29.95

#### INDIVIDUAL COMPONENTS

MOS-1416	14-16 PIN MOS CMOS SAFE INSERTER	\$ 7.95
MOS-2428	24-28 PIN MOS CMOS SAFE INSERTER	\$ 7.95
MOS-40	36-40 PIN MOS CMOS SAFE INSERTER	\$ 7.95
EX-1	14-16 PIN EXTRACTOR TOOL	\$ 1.49
EX-2	24-40 PIN CMOS SAFE EXTRACTOR TOOL	\$ 7.95

MINIMUM BILLING \$25.00. ADD SHIPPING CHARGE \$2.00. NEW YORK RESIDENTS ADD APPLICABLE TAX.

OK MACHINE & TOOL CORPORATION 3455 CONNER ST., BRONX, N.Y. 10475 (212) 994-6600/TELEX 125091

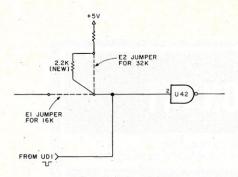


Fig. 2. Changes to 32K memory board.

disables the memory board whenever the MUB is addressed and sends out a low pulse on the UD1 line.

When the system is not being used with the multi-user software, the switch should be off. To run multi-user BASIC or Pilot, turn the switch on. The MUB can stay plugged in all the time.

#### **Another Way**

If you are interested in multi-programming, keep in mind a comment I made several months ago while discussing expansion of the SWTP 32K board to 64K. If the board is configured as two separate 32K sections, switched by a bit coming from a PIA, then you can do what the MUB does, but on a larger scale. Instead of just switching 512 bytes in and out, you can switch 32K and provide full memory for each of two users. In one 32K segment, one user could do an assembly or run BASIC, while the other could do something completely different in his 32K.

#### **Printer Interrupts**

One down-to-earth application of interrupts is to drive a printer. This is only practical if you keep a memory buffer filled with characters to be printed, while an interrupt routine empties it at the printer's own pace. In this way, the program can run ahead of the printer and pause only when the buffer becomes filled up.

In many programs, especially in BASIC, where the printer runs in bursts, this may speed up overall running time by as much as a factor of 2, because the printer can now run continuously instead of starting and stopping. The same is true of the program that drives it.

Applied Microcomputer Systems (Box 68, Silver Lake, NH 03875) has been offering an interrupt-driven parallel printer driver for some time. It is intended primarily for the SWTP PR-40 printer.

However, many of the newer printers, such as the Anadex, have a built-in buffer of 1K or more. These printers don't really need much more buffering and can be driven directly from a parallel port without any fancy programming.

A buffer would really be useful to drive a

serial printer, especially a slow one. For instance, a 1K buffer on a 110-baud teleprinter would hold 100 seconds of output, allowing a program to get 100 seconds ahead of the printer This can be most impressive if you list a program on the printer, and can go on to something else while the printer is still listing.

The programming needed to do this is easy to use. Included in this article are two versions of such an interrupt-driven printer driver. Both require an MP-S port on port 1, having a jumper in the IRQ position to enable interrupts.

Listing 1 shows a simple routine that provides only a 256-byte buffer and is intended to sit in a high RAM memory address such as A800. It essentially consists of three parts

An INITLZ routine must be called before any output to the printer driver is performed, and it sets up some pointers and flags, puts the address of the interrupt service subroutine (ISS) into the IRQ vector at A000 and returns to the calling program.

The routine uses a 256-byte buffer in memory, and two pointers are used to keep track of buffer locations. INPTR always points to the next empty location in the buffer that can be filled with an incoming character, while OUTPTR always points to the next character to be printed. The buffer is looped back on itself, so that when the last location is filled or emptied, the next location to be filled or emptied is at the beginning again. It resembles a neverending photo slide tray, with the pointer continuously cycling through the buffer.

Whenever INPTR and OUTPTR are the same, the buffer is empty; whenever OUTPTR is equal to INPTR + 1, the buffer is full. These tests are used by the program to keep track of what is going on.

BUSYFL is a flag that indicates whether the ACIA is busy. Each time a character is sent out to the ACIA, BUSYFL is set to 1. It stays at 1 until the ACIA finishes printing and generates an IRQ interrupt to ask the processor for another character, at which time it goes back to 0. Thus, 1 in BUSYFL means that the ACIA has started printing a character, but hasn't yet finished it.

The second part of the program is the IN-PUT routine, which is designed as a replacement for INEEE and is needed because IN-EEE in most monitors reconfigures the ACIA on port 1 to turn off interrupts. This would stop all printing if allowed, so INPUT does the same thing, but without the initialization.

The main part of the program is the OUT-PUT routine, which replaces OUTEEE. This routine was designed for use with standard programs such as BASIC, and so OUTPUT has some features that allow it to complete printing if BASIC returns to the monitor.

(The monitor's calling INEEE would otherwise stop printing even if there was still some data in the buffer, because INEEE normally initializes the ACIA to turn off its interrupt system.)

This is done by putting into the calling program a print of a control-F at the end of output; in BASIC, this is done with PRINT CHR\$(6). After this, the OUTPUT driver waits until the buffer is empty before returning to the calling program. This prevents the loss of the material in the buffer. Because of the way INPTR and OUTPTR are handled in this routine, this program cannot be placed in ROM.

Listing 2, on the other hand, shows another version of this program. This version is in ROM and is part of the HUMBUG monitor I described in the September 1980 *Microcomputing*.

In this version, the buffer is a 1K RAM area at D400 to D7FF. Because ten bits are now needed to point to a specific location in the buffer (as opposed to eight bits when the buffer was just 256 bytes long), INPTR and OUTPTR are now two bytes instead of one, and this complicates the programming. The INITLZ routine starts with a ten millisecond time delay to permit the ACIA on port 0 to finish any current operation and then clears INPTR, OUTPTR, POSTAT (the flag used by FCROM in the main monitor to steer non-interrupt output to port 0) and BUSYFL. Then it places the address of the ISS routine in the IRQ location of monitor RAM (at A000), puts a nonzero number into IRQON to indicate that initialization has been done and exits.

Just in case non-monitor programs want to use this routine, entry point IQPRNT is included just after the initialization routine. This entry is used by all such programs and automatically initializes whenever a control-E (hex 05) is printed. Otherwise, it falls through to OUTPUT.

#### Flex

Flex 2.0 uses SWI interrupts to handle its printer spooling feature. It changes the SWIJMP vector at A012 and does not restore it when done. Be careful if you try to debug a machine-language program with breakpoints after using Flex 2.0, since breakpoints will now return to Flex 2.0 instead of to your monitor.

Converting programs from miniFlex to Flex 2.0 or back is generally not too difficult. Basically, any machine-language program that uses disk operations maintains a file control block, or FCB, for every open disk file. In miniFlex, this FCB contains a total of 192 bytes – 64 bytes of status control info, followed by 128 bytes for the contents of one disk sector. Since Flex 2.0 has 256 bytes per sector, its FCB is 320 bytes long (64 + 256). The organization of the data in

#### SPEEDUF

```
* INPTR POINTS TO THE NEXT EMPTY LOCATION IN BUFFER
                OUTPTR POINTS TO THE NEXT LOCATION TO BE OUTPUT
                   IF INPTR=OUTPTR, BUFFER IS EMPTY
IF OUTPTR=INPTR+1 BUFFER IS FULL
              * BUSYFL INDICATES WHETHER ACIA IS BUSY
                   BUSYFL=1 HEANS ACIA HAS BEEN STARTED ON OUTPUT,
                             BUT INTERRUPT INDICATING COMPLETION HAS
                             NOT YET ARRIVED
              # MONITOR AND I/O EQUATES
   (E1D1)
              OUTEEE EQU
              PDATA EQU
   (E07E)
                            $E07E
   (FORO)
                            SFORO
   (8004)
              ACIACR EQU
                            $8004
   (8005)
               ACIADR EQU
                            ACIACR+1
               IROPTR EQU
                            $A000
   (A800)
                      ORG
                            $A800
              * TRANSFER VECTORS INTO SPEEDUP
A800 7E A82E
              VECTOU JMP
                            DUTPUT
A803 7E A820
              VECTIN JMP
                            INPUT
4806 7E 4809
              VECTIZ JMP
               * INITIALIZE ROUTINE
                                       IN CASE ACIA IS BUSY. WAIT
ABO9 B6 BOO4 INITLZ LDA A ACIACR
                     ASR A
                                       FOR CURRENT OPERATION TO COMPLETE
ABOC 47
                      ASR A
A80E 24 F9
A810 7F A86B
                      BCC
                            INITLZ
                                       INITIALIZE INPUT AND OUTPUT PTRS
                            INPTR
                      CLR
A813 7F A890
                      CLR
                            OUTPTR
A816 7F A8F4
                      CLR
                            BUSYFL
                                       ACIA NOT BUSY
A819 CE A876
                      LDX
                            #ISS
                                       POINTER TO ISS ROUTINE
A812 FF A000
                            IRQPTR
                                       INSERT IRQ TRANSFER ADDRESS
                      STX
               * INPUT FROM TERMINAL ROUTINE (NO INTERRUPTS USED)
4820 B6 8004 INPUT LDA A ACIACR
                                       WAIT FOR CHARACTER
A823 47
                      ASR A
A824 24 FA
                      BCC
                            INPUT
                      LDA A ACIADR
                                       GET THE CHARACTER
A826 B6 8005
A829 8D 03
                      BSR
                            OUTPUT
                                       STRIP OFF PARITY BIT
A82B 84 7F
                      AND A #$7F
A82D 39
                      RTS
               * OUTPUT TO TERMINAL ROUTINE
A82E 81 06
              DUTPUT CMP A #$06
                                      END OF DATA?
                      BEQ
                            DONE
A830 27 15
                                       YES
A832 01
A833 OF
                      SEI
                                       DISABLE INTERRUPT SYSTEM
                            BUSYFL
A834 7D A8F4
                      TST
                                       IS ACIA BUSY?
A837 26 1B
                            BUSY
                            ACIADR
                                       NO; ACIA IS FREE SO LET'S OUTPUT
A83C 7C A8F4
                      TNC
                            BUSYFL
                                       TURN ON BUSY FLAG
                                       ENABLE ACIA TRANSMITTER FOR IRQ
                      LDA A #$35
A83F 86 35
A841 B7 8004
                      STA A ACIACR
A844 01
                      NOP
A845 OF
                      CLI
                                       ENABLE INTERRUPTS
A846 39
                      RTS
                                       AND RETURN TO MAIN PROGRAM
              * IF DONE, CLEAN UP AND RETURN
A847 7D A8F4 DONE
                                      WAIT FOR BUFFER TO EMPTY
                     TST
                            BUSYFL
A84A 26 FB
A84C 86 15
                      LDA A #$15
                                       DISABLE ACIA TRANSMITTER INTERRUPTS
A84E B7 8004
                      STA A ACIACR
                      NOP
4851 01
                                       DISABLE INTERRUPTS
A853 39
                      RTS
              * ACIA IS BUSY, SO STORE IN BUFFER
A854 37
              BUSY
                     PSH B
A855 F6 A86B BUSY1 LDA B INPTR
                                      IS BUFFER FULL?
A858 5C
4859 F1 4890
                      CHP B OUTPTR
A85C 26 04
                     BNE
                            NOTFUL
              * FULL, SO WAIT UNTIL SOME SPACE IS AVAILABLE
A85E 01
ABSF OF
                      CLI
                                      ENABLE INTERRUPTS
                            BUSY1
                                      GO BACK AND CHECK AGAIN
4860 20 F3
                      BRA
              * NOT FULL, SO STORE CHARACTER IN BUFFER
              NOTFUL NOP
4863 OF
                      SEI
                                      DISABLE INTERRUPTS IF ENABLED ABOVE
                            SAUFX
A864 FF A8F2
                                      SAUF INDEX REGISTER
                      STX
A867 CE A8F5
                            #BUFFER
                     LDX
   (A86B)
              INPTR
                     EQU
                            *+1
                                       CAUTION - NOT PROMMABLE
A86A A7 00
                      STA A O,X
                                       STORE INTO NEXT EMPTY BUFFER LOC
A86C 7C A86B
                      THE
                            INPTR
                                      INCREMENT IN POINTER
                      NOP
A86F 01
                                       ENABLE INTERRUPTS
A871 33
                                      RESTORE B AND INDEX
                      PUL B
A872 FE A8F2
                      LBX
                            SAVEX
              *INTERRUPT SERVICE ROUTINE
A876 B6 8004 ISS
                     LDA A ACIACR
BPL ERROR
                                      DID SOMETHING ELSE INTERRUPT?
```

## SAVE APPLE® AND TRS-80®

#### NEWDOS/80

Powerful Disk Operating System for the TRS-80® designed for the sophisticated user and professional programmer.

NEWDOS/80 is not meant to replace the present version of NEWDOS 2.1 which satisfies most users, but is a carefully planned upward enhancement.

- New BASIC Commands with variable record lengths up to 4095.
- Mix or match drives 35, 40, 77, 80TK.
  Security boot-up for BASIC or machine code application programs.
- Improved editing commands.
   Enhanced RENUMBER that allows relocation.
- Device handling for routing to display and printer simultaneously.
   CDE function; striking of C, D, and E keys allows user to enter a mini-DOS.
   Compatible with NEWDOS and TRSDOS 2.3.

Superzap 3.0 and 2.1 utilities.

#### **NEW DOS FOR APPLE® "APEX"**

The complete APEX package with operating system, assembler, editor and user manuals. The package also includes a complete set of utilities to maintain files on single or multiple drive systems. (Specify 5 inch Apple disk or 8 inch disk.)

#### RELATED SOFTWARE 179 **XPLO**

FOCAL" \$59 SAVE ON APPLE II 16K

FREE MTI MEMORY UPGRADE KIT TO 48K WITH PURCHASE OF APPLE II 16K (MTI ONLY) \$1195

#### TRS-80® SOFTWARE NEW DOS+ 35 track ..... NEW DOS+ 35 ITACK AJA Business Program 1289 Disk Head Cleaner 118 Disk Drive Alignment Program 1100 1

MOD I "8" DISK SYSTEM
One SA800R DOS and Cable
Chassis and Power Supply

11095



16K RAM MEMORY KIT \$69

#### DISK DRIVE SALE!

Complete with power suppy and chassis.

TF-3 Shugart SA400	\$359
TF-1 Pertec FD200, 40 track	\$389
	\$379
TF-7 Micropolis, 77 track	\$595
TDH-1 Dual sided, 35 track	\$495
MAX Disk 2: 10 Megabyte	4995



#### **FACTORY** CLEARANCE

Demo single or dual head MPI disk drive, complete with Power Supply and Chassis. Full warranty. TDH-1D Dual 35 TK Limited Quantities

TF-8 80 TK DISK DRIVE

#### **DISK DRIVE SYSTEM**

 2 Shugart SA400
 Interface 32K
 with power/chassis 1 35-Track DOS+ SPECIAL PRICE ONLY \$1199

#### **★BARE DRIVES FOR ANY MICROCOMPUTER★**

Pertec FD200 \$282	FD250	\$359
Shugart SA400 \$279	SA800	
MPI B52 \$349	B51	\$279
		The state of the s

®Registered trade mark of Radio Shack and Apple

#### OKIDATA PRINTER LIST \$949 **OUR PRICE**



PKIN	ILEKO	
Centronics 779         *1069           Centronics 737         *899           Centronics 701-1         *1795           Spinwriter-NEC         *2549           Base 2 Printer 80, 132 col. graphics	700	





ASK FOR FREE CATALOGUE Apparat, Inc.

3304 W. MacArthur Santa Ana, CA 92704 (714) 979-9923

4401 South Tamarac Parkway Denver, Co 80237 (303) 741-1778

Telex #678401TABIRIN ALL PRICES CASH DISCOUNTED • FREIGHT FOB FACTORY

- INTERRUPT CAME FROM ACIA

# isting 2. ROMable printer driver with 1K buffer.

# MARK GORDON

DIVISION OF MARK GORDON ASSOCIATES, INC. 239 15 KENWOOD ST., CAMBRIDGE, MASSACHUSETTS 02139 (617) 491-7505

CO	M	DI	IT	F	PS
CU	•	r		L	ĸэ

Level-II 4K System	. 529.00
Level-II 16K System	659.00
Model-II 64K System	3499.00

#### **DISK DRIVES**

40 Track 51/4 inch drive	319.00
77 Track 51/4 inch drive	549.00
4 Disk Drive Cable	. 39.00

#### **PRINTERS**

Centronics 730	599.00
Centronics 779-2	799.00
Centronics 737	849.00
Comprint 912p	599.00
Integral Data 440G	
NEC 5510 w-tractor	2679.00
TI 810 Basic	1895.00

#### MISC HARDWARE

Expansion int. TRS-80(Ok)	249.00
Novation Cat modem	159.00
16K Memory Kit	. 49.00
Leedex Monitor	
Printer Cable for above	. 49.00
ISO-2 Isolator	. 54.00
AC LINE FILTER	. 24.00

#### STORAGE MEDIA

Verbatim-box	10-51/4
Memorex-box	10-51/4
Plastic Storage	Box

#### **OPERATING SYSTEMS**

NEWDOS by APPARAT INC49	00.0
NEWDOS + by APPARAT INC99	.00
MMS FORTH DISKETTE-PRIMER79	.95

#### **DISKETTE TRS-80\* BUSINESS SOFTWARE BY SBSG**

Free enhancements and upgrades to registered owners for the cost of media and mailing. 30 day free telephone support. User reference on request.

Fully Interactive Accounting Package, General Ledger, Accounts Payable, Accounts Receivable and Payroll.

Report Generating.	
Complete Package (requires 3 or 4 drives)	\$475.00
Individual Modules (requires 2 or 3 drives)	\$125.00
Inventory II: (requires 2 or 3 drives)	\$ 99.00
Mailing List Name & Address II	
(requires 2 drives)	\$129.00
Intelligent Terminal System ST-80 III:	\$150.00
The Electric Pencil from Michael Shrayer	\$150.00
File Management System:	\$ 49.00

#### **FINE PRINT**

TRS-80 is a Tandy Corporation trademark. Use of above operating systems may require the use of Radio Shack TRS-DOS. Radio Shack equipment subject to the will and whim of Radio Shack.

#### ORDERING INFORMATION

We accept Visa and Mastercharge. We will ship C.O.D. certified check or money orders only. Massachusetts residents add 5 percent sales tax.

The Company cannot be liable for pictorial or typographical inaccuracies.

```
BUSYFL
                                      ACIA NO LONGER BUSY.
A87B 7F A8F4
                                      IS THE BUFFER EMPTY?
AB7E B6 A86B
                     I DA A INPTR
A881 R1 A890
                     CMP A OUTPTR
A884 26 06
                      BNE
                          NOTENT
                                      DISABLE ACIA TRANSMITTER INTERRUPTS
                      LDA A #$15
A888 B7 8004
                     STA A ACIACR
A88B 3B
                     RTI
              * BUFFER NOT EMPTY, SO OUTPUT THE NEXT CHARACTER
A88C CE A8F5 NOTEMT LDX
                            #BUFFER
                                       CAUTION - NOT PROMMABLE
   (A890)
              DUTPTR EQU
                            *+1
                                       GET NEXT CHARACTER
A88F A6 00
                      LDA A O.X
A891 B7 8005
                      STA A ACIADR
                                      OUTPUT IT
                                       INCREMENT OUTPUT POINTER
                      INC
                            DUTPTR
                                       ACIA IS BUSY AGAIN
A897 7C A8F4
                      INC
                            BUSYFL
                      RTI
                                       RETURN TO PROGRAM
A89A 3B
              * ERROR ROUTINE - INTERRUPT NOT CAUSED BY ACIA
A89B 86 15
                                      DISABLE ACIA INTERRUPTS
              ERROR LDA A #$15
STA A ACIACR
A89B B7 8004
ABAO B6 AB6B ERROR1
                     LDA A INPTR
                                       SEE IF BUFFER IS EMPTY
                      CMP A GUTPTR
A8A6 27 13
                      BEQ
                            EMPTY
                      LDA A OUTPTR
                                       NO. SO EMPTY IT BEFORE QUITTING
A8A8 B6 A890
A8AB B7 A8B2
                      STA A GETCHR
ABAE CE ABF5
                      LDX
                            #BUFFER
                                       CAUTION - NOT PROMMABLE
   (A8B2)
              GETCHR EQU
                            *+1
                                       GET NEXT CHARACTER
A8B1 A6 00
                      LDA A O,X
A8B3 BD E1D1
                      JSR
                            OUTEEE
                                      PRINT IT
A8B6 7C A890
A8B9 20 E5
                                      INCREMENT POINTER
                      TNC
                            DUTPTR
                                       GO BACK AND TEST AGAIN
                            ERROR1
                      BRA
               *BUFFER EMPTY, SO PRINT ERROR MESSAGE AND QUIT
ASBB CE ASC4 EMPTY LDX
                            #ERRMSG
                                      PRINT ERROR MESSAGE
ABBE BD E07E
                      JSR
                            PDATA
ABC1 7E EODO
                            MONITR
                      JMP
                                      RETURN TO MONITOR
A8C4 OD
              ERRHSG FCB
                            $B,$A,0,0,0,0
                     FCC
                            /ERROR - INTERRUPT NOT CAUSED BY ACIA /
A8F1 04
                     FCB
                            $04
               * BATA ETC.
A8F2
              SAVEX RMB
BUSYFL RMB
                          2
                                      INDEX STORAGE
                                       ACIA BUSY FLAG
A8F4
                                       256-BYTE BUFFER
               BUFFER RMB
                      END
               * PORT O PRINTER INTERRUPT DRIVERS
               * INPTR POINTS TO THE NEXT EMPTY LOCATION IN BUFFER
                OUTPTR POINTS TO THE NEXT LOCATION TO BE OUTPUT
                   IF INPTR=OUTPTR, BUFFER IS EMPTY
IF OUTPTR=INPTR+1 BUFFER IS FULL
                BUSYFL INDICATES WHETHER ACIA IS BUSY
                    BUSYFL=1 HEANS ACIA HAS BEEN STARTED ON OUTPUT,
```

```
BUT INTERRUPT INDICATING COMPLETION HAS
NOT YET ARRIVED
```

			* INIT	IALIZE	ROUTINE	
ECCF	FF	BO4A	INITLZ	STX	SAVEDX	
ECD2	CE	04E2		LDX	#\$04E2	
ECD5	09		INWALT	DEX		WAIT ABOUT 10 HILLISEC
ECD6	26	FD		BNE	INUAIT	FOR ACIA TO FINISH IF BUSY
ECD8	CE	0000		LDX	#0	
ECDB	FF	D051		STX	INPTR	
ECDE	FF	D053		STX	OUTPTR	RESET INPUT AND OUTPUT POINTERS
ECE1	7F	B000		CLR	POSTAT	TURN OFF NORMAL PORT O DUTPUT
ECE4	7F	D050		CLR	BUSYFL	ACIA NOT BUSY
ECE7	CE	EB60		LDX	#ISS	RESET IRQ POINTER ADDRESS TO ISS
ECEA	FF	A000		STX	IRQ	
ECED	7F	D05A		CLR	IRQON	
ECF0	70	B05A		INC	IRQON	TURN ON IRQ IN PROGRESS FLAG
ECF3	FE	BO4A		LBX	SAVEDX	
ECF6	39			RTS		AND RETURN

#### NON-MONITOR ENTRY POINT

IQPRNT CHP A #\$05

ECF7 81 05

ED1F OF

ELFY	21	D4		BEU	INTILZ	DINERWISE PALL INCOOR TO COTFOT
			* OUTP	UT TO	TERMINAL	ROUTINE
ECFB	81	06	OUTPUT	CHP	A #\$06	END OF DATA?
ECFD	27	15		BEQ	DONE	YES
ECFF	01			NOP		NO
EDOO	0F			SEI		DISABLE INTERRUPT SYSTEM
ED01	7 D	D050		TST	BUSYFL	IS ACIA BUSY?
EB04	26	1E		BNE	BUSY	YES
ED06	<b>B7</b>	8001	FREE	STA	A ACIADR	NO; ACIA IS FREE SO LET'S OUTPUT
ED09	70	D050		INC	BUSYFL	TURN ON BUSY FLAG
EDOC	86	35		LDA	A #\$35	ENABLE ACIA TRANSMITTER FOR IRQ
EDOE	<b>B7</b>	8000		STA	A ACIACR	
ED11	01			NOP		
ED12	0E			CLI		ENABLE INTERRUPTS
ED13	39			RTS		AND RETURN TO HAIN PROGRAM

ON CONTROL-E, GO INITIALIZE

#### \* IF DONE, CLEAN UP AND RETURN WAIT FOR BUFFER TO EMPTY ED14 7D D050 DONE TST BUSYFL

SEI

EB17	26	FB	BNE		DONE				
ED19	84	15	LDA	A	#\$15	DISABLE	ACIA	TRANSMITTER	INTERRUPTS
EDIB	<b>B7</b>	8000	STA	A	ACIACR				
EDIE	01		NOP						

DISABLE INTERRUPTS

the first 64 bytes is the same in both systems, so changing from one Flex to the other involves just changing the size of the

A second change involves the addresses of Flex routines. MiniFlex is located at addresses 7000-7FFF, while Flex 2.0 is at A080-BFFF. Thus, all references to these locations must be changed. See Table 1 for a fairly complete list of equivalents between the two. Mini-Flex does not keep the date as Flex 2.0 does, so changing from Flex 2.0 back to miniFlex may require deleting all references to dates.

Finally, there is a slight difference in how the two systems handle the SETEXT subroutine. When this routine is executed, miniFlex changes the contents of the index register, while Flex 2.0 doesn't. Thus, if you are converting a program from Flex 2.0 back to miniFlex, you may want to save index register contents before jumping to SETEXT and then restore it.

While converting programs from Flex 2.0 back to miniFlex may not be common, I tried it recently to convert Programma's SPL/M compiler. The conversion was sim-

#### **Next Time**

A review and detailed comparison of the SPL/M compiler with several others (Microware's ABASIC, SSB's FORTRAN and Hemenway's STRUBAL +) will appear in upcoming installments.

Name	Flex 1 & 2 Address	Minifle>
LINBUF	A080	7000
FCB	A840	7740
EOLCHR	AC02	7082
HONTH	ACOE	-
DAY	ACOF	-
YEAR	AC10	-
LSTERM	AC11	7091
LINPTR	AC14	7094
CURCHR	AC18	709A
COLDS	ADOO	7100
WARMS	AD03	7103
RENTER	ADO6	7106
OUTCH2	AD12	7136
GETCHR	AD15	710F
PUTCHR	AD18	7112
INBUFF	AD1B	7115
PSTRNG	AD1E	7118
CLASS	AD21	711B
PCRLF	AD24	711E
NXTCH	AD27	7121
RSTRIO	AD2A	7124
GETFIL	AD2D	7127
LOAD	AD30	712A
SETEXT	AD33	712D
ADDBX	AD36	7130
OUTDEC	AD39	7133
OUTHEX	AB3C	7139
RPTERR	AD3F	713C
GETHEX	AB 42	713F
OUTADR	AD45	_
INDEC	AD48	-
DOCHND	AD 4B	7142
HEXADJ	B198	74BA
OPREAD	B2A4	758A
FMSCLS	B403	7803
FMS	B406	7806

Table 1. Flex routine addresses.



nets you up and running the very first night. with your own TV for a video

display, \$99.95 ELF II includes RCA 1802 8-bit microprocessor addressable to 64k bytes with DMA, interrupt, 16 registers, ALU, 256 byte RAM, full hex keyboard,

two digit hex output display, stable crystal clock for timing purposes, RCA 1861

video IC to display your programs on any video monitor or TV screen and 5-slot

nsion bus (less connectors) to expand ELF II into a giant

Master ELF II's \$99.95 capabilities, then expand with GIANT BOARD

KLUGE BOARD. 4k RAM BOARDS. TINY BASIC. ASCII KEYBOARD. LIGHT PEN. ELF-BUG MONITOR. COLOR GRAPHICS & MUSIC SYSTEM.

. and, another great reason for getting your ELF now

TEXT EDITOR...ASSEMBLER...DISASSEMBLER...VIDEO DISPLAY BOARD

BREAKTHROUGH!

Netronics proudly announced the release of

the first 1802 FULL BASIC, written by L.

Sandlin, with a hardware floating point RPN

math package (requires 8k RAM plus ASCII and video display boards), \$79.95 plus \$2 p&h. Also

available for RCA VIP and other 1802 systems

to program an ELF II in almost no time at all. Our Short Course On Microprocessor & Computer Programming—written in non-technical language—guides you through each of the RCA COSMAC 1802's capabilities, so you'll understand

everything ELF II can do. . . and how to get ELF II to do it! Don't worry if you've

been stumped by computer books before. The Short Course represents a major

advance in literary clarity in the computer field. You don't have to be a computer

engineer in order to understand it. Keyed to ELF II, it's loaded with "hands on"

illustrations. When you're finished with the Short Course, neither ELF II nor the

In fact, not only will you now be able to use a personal computer creatively,

you'll also be able to read magazines such as BYTE. . . INTERFACE AGE . . . POPU-LAR ELECTRONICS and PERSONAL COMPUTING and fully understand the

articles. And, you'll understand how to expand ELF II to give you the exact

If you work with large computers, ELF II and the Short Course will help you

\$99.95 ELF II includes all the hardware and software you need to start writing and running programs at home, displaying video graphics on your TV screen and

designing circuits using a microprocessor - the very first night-even if you've

ELF II connects directly to the video input of your TV set, without any addi

fascinating new target/missile gun game that was developed specifically for ELF II. But games are only the icing on the cake. The real value of ELF II is that it gives you a chance to write machine language programs-and machine language is the fundamental language of all computers. Of course, machine language

only a starting point. You can also program ELF II with assembly language and ut ELF II's machine language capability gives you a chance to

develop a working knowledge of computers that you can't get from running only

Tom Pittman's Short Course On Microprocessor & Computer

Get Started For Just \$99.95, Complete!

ow minimal your computer background is now, you can learn

**ELF II Explodes Into A Giant!** 

(send for details)!

Master This Computer In A Flash!

RCA 1802 will hold any mysteries for you.

never used a computer before.

Power Supply (required), \$4 95 postpaid RCA 1802 User's Manual, \$5 postpaid

ALSO AVAILABLE FOR ELF II -

GIANT BOARD<sup>TM</sup> kit with cassette I/O. RS 232-C/TTY I/O. 8-bit P I/O. decoders for 14 separate I/O instructions and a system monitor/editor \$39.95 plus \$2 p&h

\$2 p&h |
| Kluge (Prototype) Board accepts up to 36 IC s \$17.00 plus \$1 p&h |
| 4 Static RAM kit. Addressable to any 4k page to 64k \$89.95 plus \$3 p&h |
| Gold plated \$8-pin connectors (one required for each plug-in board) \$5.70 ea. postpaid |
| Francing Power Sunphy (required when adding 4k |
| Francing Power Sunphy (required when adding 4k |
| Francing Power Sunphy (required when adding 4k |
| Francing Power Sunphy (required when adding 4k |
| Francing Power Sunphy (required when adding 4k |
| Francing Power Sunphy (required when adding 4k |
| Francing Power Sunphy (required when adding 4k |
| Francing Power Sunphy (required when adding 4k |
| Francing Power Sunphy (required when adding 4k |
| Francing Power Sunphy (required when adding 4k |
| Francing Power Sunphy (required when adding 4k |
| Francing Power Sunphy (required when adding 4k |
| Francing Power Sunphy (required when adding 4k |
| Francing Power Sunphy (required when adding 4k |
| Francing Power Sunphy (required when adding 4k |
| Francing Power Sunphy (required when adding 4k |
| Francing Power Sunphy (required when adding 4k |
| Francing Power Sunphy (required when adding 4k |
| Francing Power Sunphy (required when adding 4k |
| Francing Power Sunphy (required when adding 4k |
| Francing Power Sunphy (required when adding 4k |
| Francing Power Sunphy (required when adding 4k |
| Francing Power Sunphy (required when adding 4k |
| Francing Power Sunphy (required when adding 4k |
| Francing Power Sunphy (required when adding 4k |
| Francing Power Sunphy (required when adding 4k |
| Francing Power Sunphy (required when adding 4k |
| Francing Power Sunphy (required when adding 4k |
| Francing Power Sunphy (required when adding 4k |
| Francing Power Sunphy (required when adding 4k |
| Francing Power Sunphy (required when adding 4k |
| Francing Power Sunphy (required when adding 4k |
| Francing Power Sunphy (required when adding 4k |
| Francing Power Sunphy (required when adding 4k |
| Francing Power Sunphy (required when adding 4k |
| Francing Power

Expansion Power Supply (required when adding 4k RAM) \$34.95 plus \$2 p&h Professional ASCII Keyboard kit with 128 ASCII upper / lower case set. 96 printable characters, onboard regulator, parity, logic selection and choice of 4 hand-staking signals to mate with almost any computer. \$64.95 plus \$2 p&h

☐ Deluxe metal cabinet for ASCII Keyboard, \$19.95 plus \$2.50 p&h

Write and run programs-the very first night-even if you've never used a computer before!

You're up and running with video graphics for just \$99.95 then use low cost add-ons to create your own personal system that rivals home computers sold for 5-times ELF II's low price!

re-recorded tape cassettes.

ELF II Gives You The Power To Make Things Happen! Expanded, ELF II can give you more power to make things happen in the real world than heavily advertised home computers that sell for a lot more money. Thanks to an ongoing committment to develop the RCA 1802 for home computer use, the ELF II products—being introduced by Netronics—keep you right on the outer fringe of today's small computer technology. It's a perfect computer for engineering, business, industrial, scientific and personal applications.

Plug in the GIANT BOARD to record and play back programs, edit and debug programs, communicate with remote devices and make things happen in the outside world. Add Kluge (prototyping) Board and you can use ELF II to solve special problems such as operating a complex alarm system or controlling a printing press. Add 4k RAM Boards to write longer programs, store more information and solve more sophisticated problems.

ELF II add-ons already include the ELF II Light Pen and the amazing ELF-BUG Wonitor – two extremely recent breakthroughs that have not yet been duplicated

The ELF-BUG Monitor lets you debug programs with lightening speed because the key to debugging is to know what's inside the registers of the microprocessor. And, with the ELF-BUG Monitor, instead of single stepping through your programs, you can now display the entire contents of the registers on your TV screen. You find out immediately what's going on and can make any necessary

The incredible ELF II Light Pen lets you write or draw anything you TV screen with just a wave of the "magic wand." Netronics has also introduced the ELF II Color Graphics & Music System-more breakthroughs that ELF II owners were the first to enjoy!

**ELF II Tiny BASIC** 

Now Available!

Ultimately, ELF II understands only machine language-the fundamental coding required by all computers. But, to simplify your relationship with ELF II, we've introduced an ELF II Tiny BASIC that makes communicating with ELF II a

#### Now Available! Text Editor, Assembler, Disassembler And A New Video Display Board!

The Text Editor gives you word processing ability and the ability to edit programs or text while it is displayed on your video monitor. Lines and characters may be quickly inserted, deleted or changed. Add a printer and ELF II can type letters for you-error free-plus print names and addresses from your

ELF II's Assembler translates assembly language programs into hexidecimal machine code for ELF II use. The Assembler features mnemonic abbreviations rather than numerics so that the instructions on your programs are easier to read—this is a big help in catching errors.

ELF II's Disassembler takes machine code programs and produces assembly anguage source listings. This helps you understand the programs you are working with ... and improve them when required.

w ELF II Video Display Board lets you generate a sharp, professional 32 or 64 character by 16 line upper and lower case display on your TV screen or video monitor—dramatically improving your unexpanded \$99.95 ELF II. When you get into longer programs, the Video Display Board is a real blessing!

#### tional hardware, Or, with an \$8.95 RF modulator (see coupon below), you can connect ELF II to your TV's antenna terminals instead. ELF II has been designed to play all the video games you want, including a

☐ A-D/D-A Board Kit includes 1 channel (expandable to 4) D-A, A-D converters, \$39.95 plus \$2 postage & hand-

☐ PILOT Language—A new text-oriented language that allows you to write educational programs on ELF II with speed and ease! Write programs for games ...unscrambling sentences...spelling drills..."fill in the missing word" tests, etc.! PILOT is a must for any ELF II owner with children. PILOT Language on cassette tape, only \$19.95 postpaid!

Game Package on cassette tape (requires 4k RAM), \$9.95 plus \$2 postage & handling. Clip Here and Attach to Your Order Below! -

333 Litchfield Road, New Milford, CT 06776 PHONE ORDERS ACCEPTED!

Yes! I want my own computer! Please rush me—
RCA COSMAC ELF II language, it's a learning breakthrough for engineers and laymen kit at \$99 95 plus \$5 postage and alke \$5 postpaid

andling (requires 63 to 8 volt AC power | Deluxe Metal Cabinet with plexiglas dust cover for ELF II.

☐ Deluxe Metal Cabinet with plexiglas dust cover for ELF II. (Conn. res. add tax) \$29.95 plus \$2.50 p&h.

□ I am also enclosing payment (including postage & handling) for the items checked below! ☐ Tom Pittiman's Short Course On Microprocessor & Computer ☐ I want my ELF II wired and tested with power supply. RCA Programming teaches you just about everything there is to know 1802 User's Manual and Short Course—all for just \$149.95 plus about ELF II or any RCA 1802 computer Written in non-technical \$3 p&h.

CHARGE IT! Exp. Date \_
☐ Visa ☐ Master Charge

(Bank # \_\_

Total Enclosed \$

Account #

programs and produces assembly language source list-ings to help you understand and improve your programs \$19.95 on cassette lape

SAVE \$9.90—Text Editor, Assembler & Disassembler purchased together, only \$49.95! (Require Video Display Board plus 44 memory.)

ELF II Light Pen, assembled & tested, \$7.95 plus \$1

☐ ELF II Color Graphics & Music System Board kit. \$49.95 plus \$2 p&h.

ELF II connects directly to the video input of your ty set without additional hardware. To connect ELF II to your antenna terminals instead, order RF Modulator. \$8.95 postpaid. Coming Soon: A-D, D-A Converter, Controller Board and more!

Address

CALL TOLL FREE: 800 243-7428 **DEALER INQUIRIES INVITED** 

\$\$ postpard.

"ELF-BURTM Deluxe System Monitor on cassette tape. Allows displaying the contents of all registers on your tv at any point in your program. Also displays 24 bytes of memory with full addresses, blinking cursor and us scrolling. A must for the serious programment \$14.95 postpand. Text Editor on cassette tape gives you the ability to insert, delete or edit lines and words from your programs while they are displayed on your video monitor. (Add while they are displayed on your video monitor. (Add printer and you can use ELF. II to type error-free letters plus insert names and addresses from your mailing list.) \$19.95 postpaid.

26 variables A-Z. LET. IF/THEN. INPUT. PRINT, GO TO. GO SUB. RETURN. END. REM. CLEAR. LIST. RUN. PLOT. PEEK. POKE. Comes fully documented and includes alphanumeric generator required to display alphanumeric characters directly on your Iv screen without additional nardware. Also plays flick-flack-five plus a drawing game that uses ELF. II is hex keyboard as a joy-stick-d kinemory required. \$14.95 postpaid.

☐ Tom Pittman is Short Course on Tiny Basic for ELF. II. \$5 postpaid.

al 32 or 54 chalacter by 16 line upper and 1939 soptshad.

□ Assembler on cassette tape translates assembly yimproving your unexpanded \$99 95 ELF II language programs into hexidecimal machine code for inside ASCII (Réyboard cabine) 1889.95 ELF II use. Minemonic abbrevations for instructions to \$2 50 pt. 15 p

plus S2-90 p8h

— Video Display Board kit lets you generate a sharp,
professional 32 or 64 character by 16 line upper and
lower case display on your 14 screen or video monitor—
dramatically improving your unexpanded \$99.95 ELF II,
Erts inside ASCII Keyboard cabinet.) \$89.95
plus S2 p8h

✓ Reader Service index—page 241

## MARK GORDON COMPUTERS

DIVISION OF MARK GORDON ASSOCIATES, INC. > 84
15 KENWOOD ST., CAMBRIDGE, MASSACHUSETTS 02139
(617) 491-7505

## SORT-80

#### Produced exclusively for Mark Gordon Computers by SBSG

TRS-80\* disk files may be sorted and merged using SORT-80, the general purpose, machine language, sort program. Written in assembly language for the Z-80 microprocessor, it can:

- -Sort files one disk in length
- Sort Direct Access, Sequential Access and Basic Sequential Access files
- -Reblock and print records
- -Recontrol files from disk
- —Be executed from DOS
- -Be inserted in the job stream
- -Allow parameter specification
  - input/output file specification
  - input/output record size
  - lower/upper record limit
  - print contents of output file
  - input/output file key specifiers

The minimum requirement is a 32K TRS-80\* Level II computer with one disk drive or a single drive Model II computer. It will operate on 35, 40 and 77 track drives, and has been tested on TRSDOS 2,1, 2.2, 2.3, NEWDOS 2.1, 3.0 and VTOS 3.0.1. It is compatible with most machine language printer drivers. Sort time is fast: for example, a 32K file will sort in approximately 40 seconds. \$59.

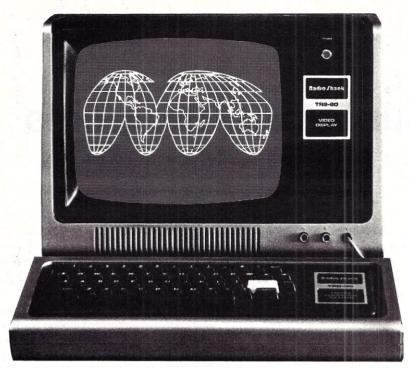
InfoBox is the easiest-to-use information manager available for the TRS-80\*. It's ideal for keeping track of notes to yourself, phone numbers, birthdays, inventories, bibliographies, computer programs, music tapes, and much more. This fast assembly language program lets you enter free-format data, variable length items and lets you look up items by specifying a string of characters or words that you want to find. You can also edit and delete items. Items entered into InfoBox can be written to and read from cassette and disk files. All or selected items can be printed on a parallel or serial printer. InfoBox occupies 3K. Specify cassette or disk version. \$29.95





\*TRS-80 is a Tandy Corp. Trademark

ED20 7F D05A ED23 39	CLR IROON TURN OFF CURRENT IRO OUTPUT FLAG
	* ACIA IS BUSY, SO STORE IN BUFFER
ED24 37	BUSY PSH B
ED25 FF D048 ED28 FE D051	
ED2B 08	INX
ED2C 8C 0400	CPX #\$0400 FIX OVERFLOW OVER 1K
ED2F 26 03 ED31 CE 0000	BME BUSY2 LDX #\$0000
EB31 CE 0000	BUCY2 CPY OUTPTR
ED37 26 04	BUSY2 CPX OUTPTR BNE NOTFUL
2007 20 01	* FULL, SO WAIT UNTIL SOME SPACE IS AVAILABLE
ED39 01	NOP
ED3A OE	CLI ENABLE INTERRUPTS BRA BUSY1 GO BACK AND CHECK AGAIN
ED3B 20 EB	BRA BUSY1 GO BACK AND CHECK AGAIN  * NOT FULL, SO STORE CHARACTER IN BUFFER
	NOTFUL NOP
ED3E OF	SEI DISABLE INTERRUPTS IF ENABLED ABOVE
ED3F FE D051	LDX INPTR
ED42 BD ED97	JOX INPIR JSR FINDCH GO TO FIND INPTR LOC IN BUFFER STA A 0,X STORE INTO NEXT EMPTY BUFFER LOC LDA A INPTR LDA B INPTR+1 ADD B #1 INCREMENT IN POINTER AND A #\$03 MASK TO LIMIT TO 1K STA A INPTR
ED45 A7 00	STA A 0,X STORE INTO NEXT EMPTY BUFFER LOC
FDAA FA ROSS	I RA R INPTR+1
ED4D CB 01	ADD B #1 INCREMENT IN POINTER
ED51 84 03	AND A #\$03 MASK TO LIMIT TO 1K
LDGG DI DVGI	STA A INPTR
ED56 F7 D052 ED59 01	STA B INPTR+1
EDSA OE	
ED5B 33	PUL B RESTORE B AND INDEX
ED5C FE D048	LDX SAVEX
ED5F 39	RTS RETURN
	*INTERRUPT SERVICE ROUTINE
FDA0 RA 8000	ISS LDA A ACIACR DID SOMETHING ELSE INTERRUPT?
ED63 2A 4B	BPL ERROR IF YES
	* OK - INTERRUPT CAME FROM ACIA
ED65 7F D050	
ED68 FE D051 ED6B BC D053	
ED6E 26 06	DUE NOTENT NO
ED70 86 15	
ED72 B7 8000	SIA A ACIACK
ED75 3B	RTI RETURN
ED74 FE D053	* BUFFER NOT EMPTY, SO OUTPUT THE NEXT CHARACTER NOTEHT LDX OUTPTR
ED79 BD ED97	
ED7C A6 00	LDA A O,X GET NEXT CHARACTER
ED7E B7 8001	STA A ACIADR OUTPUT IT
ED81 B6 D053	
ED84 F6 D054 ED87 CB 01	ADD B #1 INCREMENT OUT POINTER
ED89 89 00	ADC A #0
ED8B 84 03	AND A #\$03 HASK TO LIMIT TO 1K
ED8D B7 D053	
ED90 F7 D054 ED93 7C D050	STA B OUTPTR+1 INC BUSYFL ACIA IS BUSY AGAIN
ED96 3B	RTI RETURN TO PROGRAM
2070 00	
	* FINDCH - ADD POINTER TO BUFFER ADDR
	FINDCH STX TEMP SAVE POINTER
ED9A 36 ED9B B6 D055	FOR H HAD SHOE CHARACTER
ED9E F6 D056	
EDA1 CB 00	
EDA1 CB 00 EDA3 89 D4	ADC A #BUFFER/256
EDAS B7 DOSS	
EDAB FF DOSS	
EDAE 32	PUL A RESTORE CHARACTER
EDAF 39	RTS
	* CORON DOUTTHE THTERRIBT NOT CAUSED BY ACTA
EDBO 86 15	* ERROR ROUTINE - INTERRUPT NOT CAUSED BY ACIA ERROR LDA A #\$15 DISABLE ACIA INTERRUPTS
EDB2 B7 8000	
EDB5 FE DO51	EDDOD'S INV. TAIDED CEE TO DISCEED TO EMPTY
EDB8 BC D053	CPX OUTPTR
EDBB 27 1F	BEQ EMPTY YES
EDBD FE D053 EDCO BD ED97	ISR FINDCH FIND OUTPIR CHAR IN RUFFER
EDCT A4 OO	
ERCS RR ECOC	LDA A 0,X GET NEXT CHARACTER JSR OUTEEE PRINT IT
EDC8 B6 D053	LDA A OUTPTR
EDCB F6 D054	LDA B OUTPTR+1
EDCE CB 01 EDD0 89 00 EDD2 84 03	ADD B #1 INCREMENT OUT POINTER ADC A #0
EDD2 84 03	AND A #\$03 HASK TO LIMIT TO 1K
EDD2 84 03 EDD4 B7 D053	STA A DUTPTR
Chn, Li hond	SIH D GOTTINTI
EDDA 20 D9	BRA ERROR1 GO BACK AND TEST AGAIN
EDDC CE EDES	*BUFFER EMPTY, SO PRINT ERROR MESSAGE AND QUIT EMPTY LDX #ERRMSG
EDDF BD FC12	
EBE2 7E FC03	JHP WARMST RETURN TO MONITOR
EDE5 OD	ERRMSG FCB \$D,\$A,0,0,0,0
EDEB 45	ERRMSG FCB \$D,\$A,0,0,0,0 FCC /ERROR - IRQ NOT FROM ACIA/ FCB \$04
EE04 04	FLD 3V4



## CompuServe's information service.

A world of information available. Right now.

If you have a personal computer—or a computer terminal — CompuServe can bring a world of information into your home or small business.

#### CompuServe

CompuServe is a major computer services company that has been serving top industrial and governmental clients for more than a decade. Now we're also applying our extensive computing capacity to the delivery of information services to your personal computer.

#### The Information Service

This exciting service is available in more than 250 cities between 6 p.m. and 5 a.m. weekdays, all day weekends and most holidays. Cost? Only \$5.00 per hour billed in minutes. All you need is a 300 baud modem, and our complete information service is only a local phone call away.

Welcome to CompuServe's information service.

- News. Weather. Sports. Major regional newspapers. Plus international news services.
- Finance, MicroQuote, Updates and historical information on stocks, bonds and commodities.
- Entertainment. Theatre, book, movie and restaurant reviews. Plus opera, symphony, ballet, dance, museums, galleries...
- Electronic Mail. Create, edit, send and receive messages from any other CompuServe user... nationwide.

- Home & Educational Reference Service. Anything you want to know...from encyclopedia information to household tips.
- CompuServe User Information. In case you need technical help... and information on new services as they become available.
- *MicroNET*. For the computer hobbyist. Software Exchange, line printer art gallery, challenging games, programming languages, word processing, business & educational programs ... and much, much more.

And this is just the beginning. CompuServe is continually adding to its list of available services. The world of electronic information isn't coming tomorrow. It's here today.

#### CompuServe is Available at Radio Shack® Stores

Your local Radio Shack® Store Sells CompuServe's information service. There are more than 6,000 Radio Shack® Stores and Dealers nationwide. Check with the outlet nearest you.

Radio Shack is a division of Tandy Corporation.

## CompuServe

Information Service Division 5000 Arlington Centre Blvd. Columbus, Ohio 43220 (614) 457-8600

## Speed Up Your BASIC Programs

#### Simple techniques do make a difference; they can work for you, too.

1	FOR A = B TO C	2.8
2	NEXT	1.1
3	NEXTA	1.5
4	REM	0.4
5	DATA 1	0.4
6	RESTORE	0.4
7	A = A	1.4
8	A = 1	2.0
9	each additional digit BB = 1	2.1
10		0.1
	GO TO 3	0.1
13	GOSUB RETURN	1.2
14	PRINT	72
15	PRINTA	80
16		72
	each additional character	0.3
18		3.6
19	C = A + B  or  C = A - B	2.6
20	each additional + A	1.1
21	$C = A \cdot B \text{ or } C = A/B$	3.4
	each additional *A	1.8
23	IF CTHEN 5 where C = A <b false<="" is="" td=""><td>1.2</td></b>	1.2
24	C = A <b false<="" is="" td=""><td>2.9</td></b>	2.9
25	IF A <b 5="" false<="" td="" then=""><td>2.5</td></b>	2.5
26	: for 2 statements on a line	0.1 saved
27	space in a line	0.03
28	examine 1 entry in variable table	0.03
29	A = SQR(B)	39
30	A = SIN(B) or $A = COS(B)$	22
31	A = TAN(B)	39
32	A = ATN(B)	27
	A = EXP(B)	22
	A = LOG(B)	16
	A=BC	39
	A = B AND C	4.0
	A = B OR C	4.0
	C = NOT A	2.9
	A = USR(B)	2.3
	A = LEN(B\$)	2.6
	A = ASC(A\$)	2.4
	A\$ = LEFT\$(B\$,1) or MID or RIGHT	4.5
	A\$ = CHR\$(B)	2.8
	A\$ = STR\$(B)	7.9
45	A = VAL(B\$)	3.3

Table 1. Time (in ms) for BASIC to process each statement or fraction of a statement. Lines 12 and 13 reflect minimum times, since the times depend on how many numbers are examined. SIN functions, for example, may vary with the value of the argument. Line 26 shows the time saved for two lines of code. For all entries, the times may depend on how the statement is used.

Edward H. Carlson 3872 Raleigh Dr. Okemos, MI 48864

The secrets of speeding up BASIC are simple once you analyze how it goes about its work. Best of all, you may need to change only a small portion of the code to make it run faster.

This article's examples are for the Microsoft BASIC-IN-ROM, Version 1.0, Rev. 3.2, used on my OSI C2-4P and other Ohio Scientific computers. A similar Microsoft BASIC is used on the PET and the TRS-80. In fact, most BASIC interpreters should behave in a similar way. This article describes procedures you can use to check out your own machine.

Typically, a program spends much of its time in a small fraction of its total code. This is especially true when nested loops are present. The running time of the program is sensitive to the efficiency of the innermost loop.

#### Speed and Clarity

The BASIC interpreter decodes and executes one line of source code at a time, perhaps even branching out of the line before reaching its end. Within a line, the interpreter reads and decodes each character in turn. The fewer lines and characters the

program has, the faster the interpreter can work.

Before you go on a binge condensing your code, remember that a good program has other essential characteristics besides speed. One of the most important is clarity. This is effected in several ways that are the opposite of condensation: for example, long, descriptive variable names, spaces between words, many Remark statements and the use of subroutines to emphasize the logical structure of the program.

So if your program has nested loops, or otherwise spends most of its time in a small portion of the code, then only that code need be condensed. The rest can be written with clarity as the prime consideration (if space in memory is not also a problem).

Besides condensing your code to obtain speed, you must also realize that BASIC uses and stores its numbers in binary form and so needs to decode the decimal form that occurs in the source code. It must do this each time it reinterprets a line; it never remembers that it has decoded the number before. Assign and use names for any such decimal constants, and your programs will be greatly speeded up.

For example, Listing 1 shows three versions of a program to fill my computer's screen with the letter A. Version a runs in 25 seconds, but version b, which avoids repeated decoding of the decimal numbers, runs in ten seconds. Version c is the fastest, running in eight seconds.

It is important to note that the FOR statement is only interpreted once during the loop—at the beginning—while the NEXT statement is executed each time the interior of the loop is traversed to test for completion of the loop. So optimization of the FOR statement is not valuable in speeding up your program.

Other "slowpokes" in BASIC include the statements that reassign the flow of execu-

tion, such as GO TO, GOSUB and ON...GOTO. They can be speeded up, however. They start searching for their target line number at the lowest-numbered line in the source program and spend 0.85 milliseconds per line. This can add up to a large amount of time in a long program.

Instead of starting a program with the one-time-only housekeeping statements, continuing with the central structure and ending with the subroutines, I start my programs with a jump to high line numbers, where I put the initializing and housekeeping statements.

The main body of the program is written next, starting at lower line numbers but still high enough to leave plenty of room at the beginning for all the subroutines (or at least the ones called from time-sensitive inner loops). Another advantage is that the decimal addresses in the GOSUB statements will have fewer digits and will be decoded quicker.

#### Searching the Variable Table

When RUN is hit and execution of the program starts, there is no variable table. It is created by the interpreter as it scans lines. Each time a variable name is found, the variable table is searched. If the variable name is not already in the table, it is added at the 10 FOR I=0 TO 2047 20 POKE 53248+I,65 30 NEXT

Listing 1a.

5 0=53248 7 A=65 10 FOR I=0 TO 2047 20 POKE Q+I,A 30 NEXT

Listing 1b.

5 Q=53248: B=65 10 FORA=QTOQ+2047:POKEA.B:NEXT

Listing 1c.

end of the table.

BASIC always searches the table in order from the first-encountered to the last-encountered variables. Your most-used variables should be placed at the beginning of the table by executing a statement early in the program that defines the desired variables, such as X = 0: Y = 0: Z = 0.

The variable table search is efficient (probably because BASIC knows that each entry is exactly six bytes long). The time spent is only 0.03 milliseconds per entry examined. This is about the same time spent ignoring a space in decoding a line of source code. Paying attention to the variable table will probably not speed up your

#### PRINTERS & CRT'S Orange Micro From





IMPACT PRINTER

(LIST \$699.00)

"The BASE 2 outperforms every printer in its price range. Do a comparison and see for vourself ..."

#### **★ GRAPHICS** ★ TRACTORS/FRICTION FEED

 2K Input Buffer • RS-232 Serial, Centronics® Parallel, IEEE-488, 20 ma • TRS-80 Cable option • 60 LPM - 100 CPS • Fast form feed • User programmable character set • 64, 72, 80, 96, 120, 132 Columns / line • Expanded characters • 9.5" wide paper • Automatic skip-overperforation • Horizontal & Vertical tabs • Programmable vertical line spacing • Intel 8085 Microprocessor — over 40 software commands • Self test • 15 Baud rates to 9600 Baud . Optional foreign character sets

Interfaces to TRS-80, Apple, Atari, PET, Northstar, and most other computers.



#### TELEVIDEO CRT'S PRICES SLASHED!

TVI 912C TVI 920C

Please Call Toll Free Prices are too low to advertise

#### **PRINTERS**

<b>ANACOM 150</b> 150 CPS, wide carriage, 9 x 9 dot (List \$1350) \$ Call
CENTRONICS 737 Text processing dot matrix (Radio Shack LP IV) \$ Call
CENTRONICS 730 (Radio Shack Line Printer II)
COMPRINT 912 225 CPS Electrostatic (List \$660) 529
OKIDATA MICROLINE 80(List) \$800) 599
EPSON Dot graphics, serial, parallel \$ Call
MALIBU Dot graphics, 132 Col, Letter quality\$ Call
PAPER TIGER IDS 440 w/graphics & 2K buffer (List \$1094) 939
QUME 5/45 Typewriter quality(List \$2905) 2499
INTERFACE EQUIPMENT

SSM AIO BOARD Serial/Parallel interface board......(List \$225) 199 TRS-80 CABLES expansion interface or direct......\$ Call

## TOLL FREE (800) 854-8275

CA, AL, HI (714) 630-3322

Phone orders WELCOME. Same day shipment for VISA, MASTER CHARGE, and AMERICAN EX-PRESS. Personal checks require 2 weeks to clear. Add 3% for shipping and handling. California residents add 6%. Manufacturer's warranty included. Prices subject to





3148 E. La Palma, Suite E Anaheim, CA 92806

programs much.

#### Subroutines

It is more effective to place several statements on one line by separating them with a colon (in OSI BASIC). A time savings of 0.1 milliseconds is achieved each time such a colon is encountered. A space savings of three bytes is also achieved.

Using colons, short "subroutines" can be written directly after an IF statement on the same line, rather than using the IF . . . THEN with a GOSUB to jump to a subroutine. This saves time by omitting the search-for line number and also gives a tight execution of the "subroutine." That portion of the statement after THEN is not interpreted if the IF condition was "false."

Listing 2 shows two versions of the program. Version a uses a proper subroutine, while version b differs only in line 20, which

5 A=A: RETURN 10 FOR I=0T010000 20 IF A=1 THEN GOSUB 5 30 NEXT 40 END 100 A=1 110 GOTO 10

Listing 2a.

20 IFA=1THENA=A

Listing 2b.

has a "subroutine" on the same line with an IF. (Both of these programs are executed with "RUN100" to jump to the housekeeping lines. Version b runs 12 seconds faster than

version a, or 1.2 milliseconds saved for each GOSUB... RETURN avoided.)

#### Summary

We have discussed the principles and the most important applications for speeding up BASIC. You can see from Listing 2 how BASIC can be tested. A loop 10,000 turns long is used to execute a statement. Then the statement is replaced by one differing in some feature.

By subtracting the running times, you can find the difference in time to execute the given feature of code. Table 1 gives the running time for several BASIC statements and portions of statements for the C2-4P

Listings 1 and 2 were made on a Comprint 912 printer connected to the 6522 VIA parallel port on the CPU board of the C2-4P computer.

chr/line with guard bands. This is not a make-shift mod. It makes your video every bit as good as the 4P's plus you have switch selectable 1, 2 and 3 MHz CPU clock as well as 300, 600 and 1200 baud for cassette and serial port-all crystal controlled. Send for our \$1.00 catalog for more details. Complete plans-\$18.95 Kit-\$39.95 or send your 600 board to: Rick Lotoczky,

3281 Countryside Cir Pontiac Twp, MI 48057

and he will install the video mod for \$79.95

Other mods available: Add sound; RS-232 port; cassette motor control; cassette interface plans. (300, 600 & 1200 baud)

SOFTWARE: (With documentation) For C1, C2, 4P & 8P. Chess 1.9; Backgammon; Excellent card games; Arcade type games; Utility Programs; Mini Word Processor; Memory Maps; Editing Cursor etc

Catalog with free program (hard copy) and Memory Map for BASIC in ROM Models . . . \$1.00



3336 AVONDALE CT. WINDSOR, ONT. **CANADA N9E 1X6** (519)969-2500



168. CENTRONICS OHIO SCIENTIFIC 750 730-1 779-2 Tractor Feed Printer Superboard II C1P 8K 1049 Epson Tx-80 Tractor Printer w/Graftrax Option...

Call for Price

C8P DF C2 OEM COMPRINT COMPUTER 2499. PRINTER INTERNATIONAL NOVATION INC. Cat Modem Comprint 912 S HAZELTINE OKI-DATA Micro-80 Printer 695. 1420 1500 898. 998.

PRICES SUBJECT TO CHANGE

C4P 8K

C4P MF

MAIL & PHONE ORDERS ONLY! > 199
SHIPPING EXTRA
DELIVERY FROM STOCK TO 6 WEEKS P.O. BOX 308 Thiells, N.Y. 10984

[914] 429-9631

#### Advanced Scientific Software for

#### **TRS-80** APPLE II and NORTH STAR

#### **MATH Library**

22 quality programs (reg. 16K) including root of equations, integration, differentiation, simultaneous equations, matrix operations, interpolations, regression analysis (linear, polynomial, multiple), ordinary differential equations, partial differential equations, statistics and plotting; with detailed user manual.

TRS-80 disk, or Level II tape \$29.95 North Star disk (single density) \$34 95

#### **ODE Master**

Solves single and simultaneous ordinary differential equations; can handle even 'stiff' problems; error control and formatted output to CRT or printer; with user manual.

TRS-80 Level II, 16K tape \$14.95 Apple II disk North Star disk (single density) \$19.95



Add \$2 for shipping (foreign orders add \$5); N.J. resident add 5% sales tax. Send check or money

509 King George Rd., Cherry Hill, N.J. 08034 (609) 482-0191

## ATARI OWNERS

#### Parallel Printer Interface for the ATARI 400 / 800

Connects to controller jacks 3&4 works with BASIC / DOS / ASSEMBLER Three printer connectors available:

> ATARI 400 / 800

TRENDCOM 100 / 200 A4P-1 A8P-1 CENTRONICS 730 / 737 A4P-2 A8P-2 CENTRONICS 36 PIN\* A4P-3 A8P-3

\*Fits all other parallel Ce \*ronics plus Anadex. Base 2, Epson, Comprint and Microtek. Order by part number, MC / VISA accepted.



◆ CA sales add 6% tax

**ICROTRONICS, inc. (8)** 1125 N. Golden State

Turlock, CA 95380 (K) (209) 667-2888 / 634-8888

### **16 K UPGRADE**

TRS80, APPLE II, AND SORCERER

HIGH QUALITY PRIME 16K RAMS FOR MEMORY UPGRADE. THE KIT INCLUDES, THE RAMS, SHUNTS AND INSTRUCTIONS TO ALLOW EASY UPGRADE IN MINUTES. ALL PARTS CARRY 12 MONTH WARRANTY.

TO ORDER, SPECIFY KIT AND ENCLOSE CHECK OR MONEY ORDER. ADD \$2.00 POST AND PACKING; TEXAS RESIDENTS ADD 5% SALES

> IAN ELECTRONICS **209** P.O. BOX 14079 **AUSTIN, TEXAS 78761**

THE 1216 MICRO CLINIC

#### SYSTEM DIAGNOSTICS FOR THE MODEL I TRS-80\*

#### THE FLOPPY DOCTOR 2.2

- · Complete write/read testing for all 35 or 40 track drives
- Tests all controller functions and status bits including error reporting
- Tests drive motor speed and allows adjustment while running
- Complete error logging and summary for 1 to 4 drives

#### **MEMORY DIAGNOSTIC 2.1**

- · Write/Read section tests each address 260 times per corr plete pass
- Checks for correct refresh operation and true address uniqueness
- "M1 Worm" test executes machine code from each address, verifies execution
- · Complete error analysis is

Both diagnostics are written in Z-80 machine code and can be run continuously to verify long-term system reliability. Com-plete instruction manual includes hints to troubleshooting. Supplied on a diskette for a minimum of 16K single disk Supplied on a diskette for a minimum of 16K sing system. A must for all serious disk users, includi retailers and service centers. \*\*TM TANDY CORP.







# NOW OPEN • SHOWROOM AND REPAIR CENTER

REG. \$2195.00

8

OVER

SWEEPSTAKES

FOR

MONTH

LAST

PARALLEL OR SERIAL INTERFACE 96 CHAR FONT WHEEL HYTYPE II SUPPLIES 45 CPS (OPTIONAL) ADD \$600 TRACTORS (OPTIONAL) \$250

77-TRACK DISK **DRIVES** FOR TRS-80™

ENTER NOW!

**GRAND PRIZE** 

TRS

-80™

EXPIRES

10-31

\$ 599.00 REG

ORDER NOW TOLL FREE 1 (800) 345-8102 ● VISA-MASTER CHARGE ACCEPTED

DISK

2445.ºº FOR TRS-80, APPLE, S-100

**SUPERBRAIN** 

64K

\$2995.00

#### ASK AROUT OUR SPECIAL PURCHASE GAME SOFTWARE FOR X-MAS.

ASK ABU	JI OUR	SPECIA	AL PUNCHASE GAME	. 3	OFIV	ARE FOR A-IVIAS.	
SOFTWARE	MOD. I	MOD. II	DISK DRIVES \$ 350 MOD. I TRE	S-80 C	OMPATIBL	E	
Medical/Dental Patient Accounting		\$1500	Model II Drives			15% + OFF SELECTED TRS-80'S A	ND PERIPHERALS
Word Processing (Magic Wand)		300	1 Drive Single Enclosure		\$ 899.00		
General Ledger	\$149.95	249	1 Drive Multiple Enclosure		1069.50	16K LII w/o Key Pads	\$652
Payroll	99.95	199	Additional Drives for Mult. Enc		540.00	16K Expansion Interface	355
Data Base	149.95	299	Disk Head Cleaning Kit - Mod. I		14.95	32K Expansion Interface	450
			Disk Head Cleaning Kit - Mod. II		24.95	Centronics 730 Printer	635
	Tape	Disk	4K L II TRS-80		575.70	Centronics 737 Printer	845
Upper/Lower Case Modification	\$19.95	\$24.95	16K L II		789.60	Cable for above Printers	30
			RS-232		92.10		
Comprehensive Diagnostics	34.95	34.95	OK Expansion Interface		278.10	PRINTERS	
CP/M	\$1	175.00	Telephone Modem		179.95	NEC 5510, 5530 w/Tractors	\$2950.0
New DOS + 40 TK		100.00	Emulator CRT by Intertec		895.00	Printer Stands	from 119.00
New DOS/80	1	145.00	CRT Stands	from	139.00		
Software Documentation Available	CALL FOR	PRICES	Anti-static Mats		160.00		

## R DATA'S TRS-80™

Celebrating V. R. DATA's 8th Anniversary **SWEEPSTAKES RULES** 

- ALL ENTRIES MUST BE SUBMITTED ON ORIGINAL ENTRY BLANK
- ONE ENTRY PER PERSON.
- WINNERS SELECTED BY RANDOM DRAWING NOTIFIED BY MAIL.
- ENTRIES MUST BE RECEIVED, BY 10 31 80
- VOID WHERE PROHIBITED BY LAW, NO PURCHASE NECESSARY

**● ABOVE PRICES ARE CASH DISCOUNTED ●** CALL FOR OTHER TERMS . DEALER INQUIRES INVITED

## ORDER TOLL-FREE

777 HENDERSON BLVD. 64 FOLCROFT, PA 19032

1-800-345-8102 LOCAL CALL (215) 461-5300



## **SWEEPSTAKES**

OVER \$1700.00 in PRIZES **GRAND PRIZE - 16K LII TRS-80** TWO SECOND PRIZES - DISK DRIVES FOUR THIRD PRIZES - \$50.00 Gift Certificates

MAIL NOW TO	ENTER V	/. R.	DATA'S	SWEEPSTAKES

ADDDECC		
NAMEADDRESS	STATE	7IP
TELEPHONECOMPUTER EQUIPME	OCCUPATION	

INTENDED USE

SEND FREE CATALOG [

# Whoa, Apple

#### These two machine-language programs tighten the reins on galloping video displays.

Terry Edward Phillips 6011–4 Majors Lane Columbia, MD 21045

Apple II is one of the fastest kids on the block. When you list, DSP or trace a BASIC program, the screen fills at an impressive speed.

But this can sometimes be annoying and frustrating. If you are trying to seriously follow the information that's being output, not even a speed-reading course would help.

Fortunately, two programs can easily give you manual control over your output rate. Both work well with Apple Integer, Applesoft (cassette or firmware) and the Apple Monitor.

#### Introduction

Anything your Apple II displays on its screen resides in a predetermined reserved section of your Apple's memory. Normally, RAM locations 0400-07FF are used for storage. This screen memory area, called the primary page in the Apple manuals, is continuously queried by hardware in your Apple, which then generates the video signals for your monitor.

Interestingly, this process is completely unknown to the microprocessor. The CPU has no idea that someone else is using its memory. The system knows only that to output video data, it must deposit the data into this reserved area.

A machine-language subroutine located in ROM at location FDF0 places alphanumeric characters in the screen memory area one at a time. This and subsequently-called subroutines are responsible for placing the byte in the accumulator (passed by

the calling routine) into the screen memory, adjusting the line width, line feeds and scrolling and doing other housekeeping chores.

The BASIC interpreter and Apple monitor routines call this subroutine every time they want to communicate with you via the screen. For example, if your BASIC interpreter is executing a PRINT"APPLE" statement, the interpreter will place the ASCII code for the letter A in the accumulator and go to the subroutine at FDF0. When it returns from this subroutine (the letter A is now on the screen), the code for the letter P is then placed in the accumulator, and so forth.

The BASIC interpreter and Apple monitor

do not go directly to the location FDF0 to output a character. Rather, they look at RAM locations 0036, 0037 to find their output subroutine. When the reset key is pushed, the Apple monitor will, among other tasks, place the address of the normal video output routine, FDF0, into locations 0036, 0037. The calling routine then finds its output subroutine by executing an indirect jump to location 0036.

This means it jumps, not to location 0036, but to the 16-bit address contained in locations 0036, 0037. Thus, the calling routine, in a roundabout way, finds the normal video output routine.

At first, this technique appears to be unnecessarily complex. Why not have the in-

Address	Code		Label	Mnemonic	Comment
2DC 2DE 2E0 2E2 2E4	A9 E5 85 36 A9 02 85 37 60			LDA#E5 STA 36 LDA#02 STA 37 RTS	Place Delay Subroutine Address in locations 0036, 0037
2E5 2E6	08 48		ENTRY	PHP PHA	Save relevant registers
2E7	18		FGCLR	CLC	Clear Flag
2 <b>E</b> 8	AD 00	CO	RKYBD	LDA COOO	Read Keyboard
2EB	10 OC			BPL FLGCK	Branch to Check Flag if no key is depressed
2ED	2C 10	CO		BIT CO10	Clear Keyboard Strobe
2F0	49 91			EOR#91	Mask for control keys
2F2	F0 F3			BEQ FGCLR	Branch to Clear Flag if CTRL Q was depressed
2F4	29 FD			AND#FD	Mask for CTRL S key
2F6	D0 01			BNE FLGCK	Branch to Check Flag if not CTRL S
2F8	38			SEC	Set Flag if CTRL S is hit
2F9	BO ED		FLGCK	BCS RKYBD	Branch to Read Keyboard if Flag is Set
2FB	68			PLA	Restore relevant registers
2FC	28			PLP	
2FD	4C F0	FD	EXIT	JMP FDF0	Jump to Normal Video Output Subroutine

Program 1. Halts video output when the CTRL S key is depressed. Output is resumed when the CTRL Q key is hit.

terpreter and monitor go directly to FDF0? But this sleight of hand is useful. With this indirect method, you can route output data to any device, such as a printer, paper punch or TTY, by placing the vector address of the output routine designed for that particular device in locations 0036, 0037.

This technique of vectoring the output offers a solution to the problem at hand. You can change the vector address in locations 0036, 0037 from FDF0 to the address of a short routine whose only purpose is to provide some sort of delaying tactic. After the delay condition is satisfied, the character in the accumulator is sent to the normal video output subroutine located at FDF0. The net effect is to reduce the speed of video output.

#### **Two Patches**

Two short machine-language patches are designed to provide a delay and give you manual control over the speed of video output.

The first program checks the keyboard when a character is to be output to see if the CTRL S key was depressed. If not, the normal output is continued. If the key was depressed, the routine waits in a continuous loop until you depress the CTRL Q key. Video output, therefore, can be stopped and started by alternately striking the CTRL S and CTRL Q keys respectively.

The second program is a bit different. It uses game paddle 0 to determine the output speed. When a character is to be output, this program reads the value of paddle 0 via a subroutine in ROM. This becomes the initial value of a two-stage timing loop. When the counters in the loop are decremented to zero, the loop is exited and the character is passed to the normal output routine. This variable timing loop allows you to vary the output speed from approximately three characters per second to nearly full speed, just by varying the position of game paddle

#### **Memory Location**

Either routine, as presented, is assembled at the top of page two of memory (0200-02FF). This area of memory is normally used by the Apple monitor as a keyboard buffer. All your keystrokes between successive returns are stored here. As long as you don't type more than about 200 keys before hitting return, page two of memory can be shared amicably between the two functions. I decided to place the routines there to avoid possible conflicts with other software packages, but if its location is inconvenient or undesirable, you can relocate the programs elsewhere with only minor changes.

The selected routine can initially be entered into memory with the ROM-based assembler described in the Apple manual. Subsequent loads can be done via the tape cassette, although they are short enough that manual loading might be faster.

The selected routine is then initialized by executing a call to 02DC in the monitor mode or a CALL 732 in BASIC. You resume normal video output by executing a ROMbased subroutine with a call to FE93 or a CALL - 365 in BASIC or when reset is hit. ■

Output Subroutine

		and the second second		
Address	Code	Label	Mnemonic	Comment
2DC 2DE 2E0 2E2 2E4	A9 E5 85 36 A9 02 85 37 60		LDA#E5 STA 36 LDA#02 STA 37 RTS	Place Delay Subroutine Address in locations 0036, 0037
2E5 2E6 2E7 2E8 2E9	48 98 48 8 <b>A</b> 48	ENTRY	PHA TYA PHA TXA PHA	Save registers
2EA 2EC 2EF 2F0	A2 00 20 1E FB C8 98		LDX#00 JSR FB1E INY TYA	Set index for Paddle 0 Subroutine to read Paddle Adjust value of Paddle Copy value into A
2F1 2F2 2F3	AA CA DO FD	RSTRX INLOP	TAX DEX BNE INLOP	Restore value into X Inner delay loop
2F5 2F6	88 D0 F9		DEY BNE RSTRX	Outer loop decrement Restore inner loop if outer loop is incomplete
2F8 2F9 2FA 2FB 2FC	68 AA 68 A8 68		PLA TAX PLA TAY PLA	Restore registers
2FD	4C FO FD	EXIT	JMP FDF0	Jump to Normal Video

Program 2. Utilizes the game paddle 0 to vary the video output speed from approximately three characters per second to full speed.

#### Available Direct From DISCOUNT 199 COMPUTER PRODUCTS Master Charge & Visa Accepted (Please give card no and expiration date) TEXAS INSTRUMENTS APPLE Apple II 16K Micro Music Board \$999. Model 810 Basic Printer 1649. 168. for Apple CENTRONICS OHIO SCIENTIFIC 750. 730-1 779-2 Tractor Superboard II 359. Feed Printer 1049. C4P 8K C4P MF Epson Tx-80 Tractor Printer 1548. 795. w/Graftrax Option. Call for Price C8P DF C2 OEM COMPRINT COMPUTER PRINTER INTERNATIONAL NOVATION INC. Comprint 912 S 598. 179. HAZELTINE OKI-DATA 798 Micro-80 Printer 695. PRICES SUBJECT TO CHANGE MAIL & PHONE ORDERS ONLY! SHIPPING EXTRA DELIVERY FROM STOCK TO 6 WEEKS P.O. BOX 308

#### **MEMORY IC BONANZA**

Thiells, N.Y. 10984

INTEL 5V ONLY 16K DYNAMIC RAM: 150ns. ceramic, low power (11mw stby, 150mw oper) version of popular 16Kx1 4116. TTL compatible inputs, tri-state outputs. Equivalent to Motorola 4516, National 5295 etc. OEM list price in quantities of 1000 is \$17, our price, Inte

INTERSIL 4K DYNAMIC RAM: Equivalent to Mostek 4096, 300ns, 4Kx1, ceramic & gold, TTL compatible inputs, tri-state outputs, low power (24mw stby, 380mw oper), priced at less than ½ the usual bobby sold in sleeves of 24, \$30 per sleeve, that's Intersil

INTEL 2716 EPROMS - 5V ONLY: Ceramic, 450ns, the industry standard 2Kx8 EPROM. Sold by others from \$27 to \$59, quantity limited \$20 ea.

FULL SPEC SHEETS: Free with order or \$1.00 per set

TERMS: Prices include insured UPS 48 states, UPS COD add \$2. MC/VISA add 4%. Prime parts, new in original sleeves, guaranteed to mfr's specs. \$20 minimum order. N.J. add sales tax. Immediate shipment or immediate refund.

**ELECTRAVALUE INDUSTRIAL** 

P.O. BOX 157-K MORRIS PLAINS, NJ 07950

Phone orders 201/267-1117

(914) 429-9631

#### SURPLUS INVENTORY

\$77

22 MHz BANDWIDTH

SOLID STATE MONITORS: Sylvania 12" B&W CRT, 22MHz video handwidth. 800 line resolution! ASL Model C12ACB. OEM video pandwidth, 800 line resolution). ASL Model C12ACUS. tabletiop style without case. P4 phosphor: Injust = separate video, 1 & vert. pos. sync pulses at nominal TTL/CMOS levels. Any sweep 10-26 KHz. 115 VAC. Simple TRS-80 hookup, add 2 jumpers. Wit maint, mainual incl. timing, schematics. TRS-80 hookup etc. Sli used and like new, checked, 386. Used, checked, no burns.

FLOPPY POWER SUPPLIES (6 OUTPUTS): North #3676, brand new in orig, foam boxes, \$V/3A, 24V/1.2A, 18V/2.6A digitable, w/0V prot. & curr limiting); 12V/0.1A, 24V/0.3A (both vprot.); -12V/0.1A (adj.), Fully regulated, linear, partially encl., w/sciassy, dwgs. 3.8V/5.04·14\*, 115V/0. Will run 1 typical 8\*\*1loppy or the 16V to 12 and run 2 or 3 minitloppies.

OTHER SURPLUS BARGAINS: LETTER QUALITY ASCII KSR TERMINALS, Perkin Elmer Carousel 20ma \$1600, RS-232 \$1800, FOB. TERMINALS, Perkin Elmer Carousel 20ma \$1600, RS PORTACOM portable terminals w/built-in coupler, ' technician special, AS-IS \$250, checked \$450, FOB.

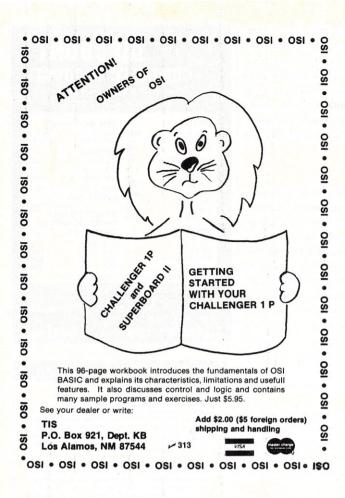
WRITE OR CALL FOR FULL SPEC SHEETS ON SPECIFIC ITEMS.

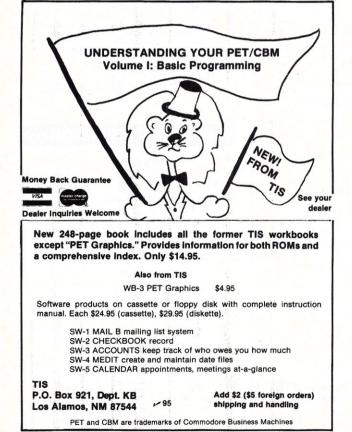
TERMS: UPS included 48 states except FOB items. UPS COD add \$2.00. VISA & MC add 4%. NJ add sales tax. Everything guaranteed working to specs. Immediate shipment or immediate refund. Phone

**ELECTRAVALUE INDUSTRIAL** 

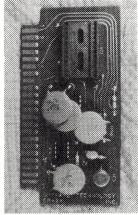
P.O. BOX 157-K MORRIS PLAINS, NJ 07950

Phone orders 201/267-1117



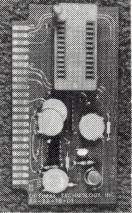


#### **EPROM PROGRAMMERS**





- PROGRAMS 2708 and 2716 **EPROMS**
- Price \$59.95 Assembled and Tested
- Kit price \$49.95
- \* Includes Connector



**EP-2A-78 SERIES** 

- PROGRAMS 2708, 2716, 2758, TMS 2716 and TMS 2532 EPROMS
- TEXTOOL ZERO FORCE SOCKET
- Price \$79.95 Assembled and Tested
- Includes Connector

Software available for the Rockwell AIM-65, MOS Technology KIM-1, Synertek SYM-1, Motorola D2, RCA VIP and many other single board computers that use the 6502, 6800, 8080/85, Z-80, 1802, F-8 and 2650 CPU's. Stock. Specify one set of software.

#### Optimal Technology Inc. 29

Blue Wood 127 Earlysville, VA 22936 U.S.A. Phone (804) 973-5482

APPLE II PLUS WITH 48K RAM	\$1190.
TEXAS INSTRUMENT 99/4 COMPUTER	\$ 989.
TI810 PRINTER	\$1590.
CENTRONIC PRINTERS:	7 7
730-1 PARALLEL PRINTER	\$ 659.
737-1 PARALLEL INTERFACE	\$ 879.
SAVE ON ALL OTHER MODELS	
SPINWRITERS FROM NEC	
5510 R/O SERIAL INTERFACE	\$2490.
5520 KSR SERIAL WITH KEYBOARD	\$2795.
5530 PARALLEL INTERFACE	\$2690.
PAPER TIGER 440	\$ 929.
440G	\$ 990.
BASE-2 PRINTERS	4 //0.
800 M.S.T.	\$ 649.
COMPRINT 912 APPLE, TRS-80, PET	\$ 559.
912 SERIAL	\$ 599.
SYM-1 W/MANUALS	\$ 229.
COMMODORE BUSINESS MACHINES:	\$ 227.
CBM 8016	\$1329.
8032	\$1595.
PET 2001-8K COMPUTER	\$ 695.
PET 2001-16K	\$ 895.
PET 2001-32K	\$1090.
PET 2022 TRAG. FEED PRINTER	\$ 749.
PET 2023 FRIC. FEED PRINTER	\$ 679.
PET 2040 DUAL FLOPPY DISK DRIVE	\$1090.
PET 8050	\$1499.
ATARI 800	\$ 849.
INTERTEC SUPERBRAIN (32K)	\$2595.
NORTH STAR COMPUTERS	\$2393.
HRZ-2-32K-D-ASM	\$2275.
HRZ-2-32K-O-ASM	\$2675.
DISPLAY TERMINALS:	\$2075.
INTERTUBE II	\$ 775.
HAZELTINE 1410	\$ 775.
HAZELTINE 1410	\$ 899.
SAVE ON COMPLETE HAZELTINE LINE	\$ 699.
IMMEDIATE DELIVERY FROM STOCK PRICES SUBJECT	TTO CHANCE
MULTI-BUSINESS COMPUTER SYSTEMS	
20 MARI POROLIGII STREET	
PORTLAND, CONN. 06480	<b>181</b>
M/F 9-6 SAT 9-3 (203) 342-2747	
WI/T 7-0 SAT 7-3 (203) 342-2141	A SECURITION OF THE PERSON OF

TWK: 710-428-6345

MBCSYS

VISA



#### **PRIAM Hard Disks Now Available** from SIRIUS SYSTEMS!



PRIAM's high-performance, low-cost Winchester disc drives speed up throughput and expand data storage from 20 megabytes to 154 megabytes. And a single controller can be used to operate 14-inch-disc drives with capacities of 33, 66, or 154 megabytes or floppy\_disc-size drives holding 20 and 34 megabytes. So it's easy to move up in capacity, or reduce package size, without changing important system elements or performance

- Fast, Linear Voice Coil Positioning DC Power required only! 50 ms Average Positioning time ■ 10 ms track-to-track positioning

- Simple, parallel Interface Optional SMD Interface
- Fully servoed head positioning
- 90 ms Maximum Positioning Time 6.4 ms Average Latency

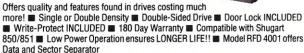
#### ■ Dedicated servo tracks THE DRIAM LINEUR

Model/Disc Size	Capacity	Size	Weight	Price	
DISKOS 3350 (14")	33Mbytes	$7" \times 17" \times 20"$	33 lbs.	\$2995	
DISKOS 6650 (14")	66 Mbytes	$7'' \times 17'' \times 20''$	33 lbs.	\$3749	
DISKOS 15450 (14")	154 Mbytes	7" × 17" × 20"	33 lbs.	\$4695	
DISKOS 2050 ( 8")	20 Mbytes	4.62" × 8.55" × 14.25"	20 lbs.	\$2995	
DISKOS 3450 ( 8")	34 Mbytes	$4.62'' \times 8.55'' \times 14.25''$	20 lbs.	\$3745	
DISKOS 570	5.3 Mbytes	floppy-size	(low)	(low)	
DISKOS 1070	10.6 Mbytes	floppy-size	(low)	(low)	
All PRIAM DISKOS Drives ha	ave a Transfer Rate of	1.03 Mbytes/Sec.	, ,	, ,	
Optional SMD interface avail					

SIRIUS SYTEMS offer cases and enclosures for all PRIAM Hard Disk Drives. All 14" Winchester Drives will mount in our 14" Standard Case. The 8" Winchesters have two alternatives: a single drive case and a dual drive case. All SIRIUS SYSTEMS Winchester drive cases include Power Supply, internal cabling, switches, fan, extra AC outlet (not switched, but fused) and possess very adequate ventilation. Drive addressing is done on the rear of the Case and not on the drive iteset to provide ease of use during operation. All WINCHESTER DRIVE Cases are Warranted for a full year and come in our standard blue-black color scheme. Consult us for current availability and pricing.

Remex RFD 4000/4001 8" Floppy Disc Drives Double sided. **Double density!!** 

RFD 4001, \$569.95



RFD 4000/4001 Technical Manual	6.95
Connector Set #3 (AC, DC, Card Edge)	10.95
Connector Set #4 (AC and DC)	2 95

RFD 4000C/B Cabinet (for use with 

Remex 1000B . . . If you've been looking for a less expensive floppy disc drive, but not wanting to sacrifice quality this is it!

\$419<sup>95</sup>

You get both in the Remex 1000B! For only \$419.95 look at what you get: ■ 8" Floppy Drive ■ Single or Double Density ■ Hard or Soft Sectoring ■ Media Protection Feature ■ Single Density Data Separator ■ 180 Day Factory Warranty

Door Lock Option \$19.95 Write Protect Option \$19.95 RFD 1000B Technical Manual .	.\$5.95
Interface Adapter Connector Set #1 RFD 1000B CASE (for use	
(REMEX-to-Shugart) \$14.95 (AC, DC, & Card Edge) \$10.95 (with Power Modules) \$	\$29.95

#### **SIRIUS 8" DISK POWER MODULES**

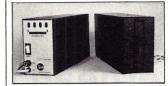
The Single and Dual Drive Power Modules are designed to provide DC and (switched) AC power for one (the Single Drive Power Module) or two (the Dual Drive Power Module—the DDPM will power three RFD 4000s 4001s) 8" Floppy Disk Drives. Many features are included for safe and reliable operation and the Dawer Medules cores with pur ston. and the Power Modules come with our standard 180 day WARRANTY (the Open Frame Power Supply warranty is for 2 years). All Power Modules will work with either the RFD 4000C/B or RFD 1000B case (color schemes match also)

**Dual Drive** Power Module (DDPM) . . . . . . \$139.95

Single Drive 

## SIRIUS 80+

**Perfect Add-Ons for Your Computer System!** 



The SIRIUS SYSTEMS 80+ Series of Floppy Disk add-ons are designed to provide unmatched versatility and performance for your computer. Consisting of four different add-ons, there is a 80+ Series Floppy Disk to meet your need. All 80+ Series Floppy Disk are compatible with the TRS-80+ and come ready to plug in!

#### COMMON CHARACTERISTICS

- 5 ms track-to-track access time
- Auto-eject 180 day WARRANTY
- Exceptional speed stability 1½%
   Single density (FM) or double density (MFM/ M²FM)

- Ultra high reliability
   2 year Power Supply Warranty
   Mix any or all 80 + Series on the same cable!
   Includes user accessible plugboard for drive reconfiguring

#### SPECIFIC CHARACTERISTICS

The SIRIUS 80+1 is a single sided, 40 track, highly reliable Floppy Disk add-on. Offering 5 more tracks than the Radio Shack model, it cost \$140 less! Formatted data storage is 102K/20K byte clarify dayble described. bytes single/double density

SIRIUS 80+1 . . .

The SIRIUS 80+2 is a dual sided, 70 track (35 per side), highly versatile Floppy Disk unit. It appears to the TRS-80\* as TWO 35 track drives, yet COST LESS THAN HALF THE PRICE! Even yet COST LESS THAN HALF THE PRICE! Even preater savings result, since data is recorded on both sides of the media instead of only a single side. Using the plug board, it may be reconfigured for other computer systems! (The 80+2 operates as Drive 0 and any of the other three addresses (with the sandard Radio Shack Cable) or as any of four drives (with the SS Standad Cable).) Formatted data storage is 80.6K/161.2K bytes single/double density.

SIRIUS 80+2 ......\$449.95

The SIRIUS 80+3 is a single sided, 80 track, "Quad" density Floppy Disk unit. Offering 2½ times the storage of a Standard Radio Shack drive, the 80+3 greatly reduces the need folksettes correspondingly. Additionally, because of the increased storage and faster track-to-track access time, the 80+3 allows tremendously increased throughput for disk based programs!!! The 80+3 INCLUDES SIRIUS'S TRAKS-PATCH on Diskette. Formatted data storage is 204K/40K8 bytes single/double density.

The SIRIUS 80+4 Floppy Disk add-on is a double sided, 160 track (80 per side), 5½." Floppy Disk technology, to 80+4 is seen by the TRS-80+ as two single sided disk drives, each with 80 tracks. Thus, in terms of capacity one 80+4 is equivalent to 4% standard Radio Shack drives — a savings of over 73% (not to mention diskettes!!). (With a double density converter, the available memory is huge!) The 80+4 is similar to the 80+2 in that it arrives configured as Drive 0 and any of the other three addresses (with the standard Radio Shack Cable) or as any of four drives (with the SS Standard Cable). The 80+4 INCLUDES TRAKS-PATCH on Diskette. (The plug board is also included.) Formatted data storage is 408K single density or 816K bytes double density.

All 80+ Series Floppy Disk add-ons operate a 5 milliseconds track-to-track access time (eight times faster than the SA 400) but are Expansion Interface Limited to 12 milli-seconds for the TRS-80\*.

\*TRS-80© Tandy Corp

We accept MC, VISA, AE, COD (requires Certified Check, Cashier's Check

## MPI 51/52 ...

#### A Great Reliable Mini-Drive!

- Fast! 5ms track to track access
- Exclusive Pulley-Band Design
- Unique Door/Ejector Mechanism
- Reliable 11/2% Speed Stability
- Single/Double Density Operation ■ Industry/ANSI Standard Interface

#### **MPI 51**

(Single Head, 40 tracks, 120K/240K bytes Single/Double Density\*\*) . . . . \$259.95 MPI 52

(Dual Head, 70 tracks, (35/side), 218.8K/437.5K Single/Double Den-

\$349.95



#### MPI 91/92 .. NEW STATE-OF-THE-ART **DISK DRIVE!**

MPI 91 (Single Head, 80 tracks, 240K/480K Single/Double Density\*\*) ...........\$389.95 MPI 92

(Single Head, 160 tracks (80/side) 480K/960K Single/Double Den 

\$499.95

#### Introducing the Versatile, Low-Cost **OMEGA Series** Controller

As new technological advances bring down the cost of fast, reliable mass data storage, the need for an inexpensive, versatile controller have be-come greater and greater. To meet this need, SIRIUS SYSTEMS OMEGA Series Controller was designed.

was designed.

The SIRIUS OMEGA Series Controller Module utilizes an on-board microprocessor to mediate data transfer to a, wide variety of peripherals from an equally wide variety of host computer systems. Up to four Winchester Hard Disks (8" or 14"), four 5'w 1" loppy Disks Drives and/or up to eight 8" Hoppy Disk Drives may be in use at one time. Host systems interfacing is accomplished via a parallel or a serial interface. With the addition of a Personality module, the OMEGA Series Controller Module is directly compatible with many popular comcompatible with many popular com-puter systems (among them the TRS-80\*, Apple, Heath, and others). Provision is made for the addition of a streaming tape drive, also.

#### SPECIFIC HARDWARE

- Control of up to twelve Floppy Disk Drives (eight 8" and/or four 5¼")

  8" and/or 5¼" Disk Drive Utilization
  Single (FM) or Double (MFM) density data

- storage

  Hard or Soft sectored diskette usage

  Ullization of "Quad" density (96 pp) 8" or 5" (10 fp) fp) for the soft up to four WINCHESTER type PRIAM DISKOS Disk Drives
- 8" or 14" may intermix on the same cable
   Accommodates 8" and/or 14" drives of
   5.3Mbytes to 154Mbytes
   Ultra-Fast data transfers
- Extremely flexible host-controller interfacing

#### SPECIFIC SOFTWARE FEATURES INCLUDE:

- Dynamic format modifications via command
- Dynamic format modifications via community words
  Extremely flexible format acceptance for unusual data storage formats
  Easily interfaces to standard operating systems (TRS-DOS\*, CP/M\*\*\*, etc)
  Operates in either get/put sector mode or data string mode
- data string mode
  Performance parameters may be changed by
  EPROM replacement or Dynaminic Repro-

Dedicated systems cards are also available on a limited basis for the STD-BUS and the S 100. These cards feature shared memory also (again, software selectable) in addition to the regular OMEGA Series Controller Module features. Consult SIRIUS SYTEMS for current price and availability for the entire line of OMEGA Series Memory Units and Controllers. Dealer inquires are invited. ies are invited.



Phone Orders Accepted 9AM-7PM (ESDT)

or Cash) and Checks (personal checks require 14 days to clear). SHIPPING AND HANDLING: \$7.00 per Floppy Disk Drive or 80+ Module ■ 5% for other items (any excess will be refunded) ■ Foreign Orders add 10% for Shipping & Handling. Payment in U.S. currency ■ Tennessee residents add 6% Sales Tax ■ VOLUME DISCOUNTS AVAILABLE

# Low Overhead Cassette Format For 6800 Systems

## No longer do you have to suffer the inconvenience of using 300 baud Kansas City Standard.

Dr. Gordon W. Wolfe Department of Physics The University of Mississippi University, MS 38677

wners of cassette-based 6800 micro-computers such as the SWTP 6800 have for years put up with the slow loading and punching process known as the Kansas City Standard and the MIKBUG cassette format. The Kansas City Standard is akin to a frequency-shift encoding, but uses an eight-fold redundancy to assure proper character recognition. This eight-fold redundancy results in character rates

of only 300 baud.

But the MIKBUG format is the real culprit in most 6800-based systems. MIKBUG was one of the first, and certainly the most successful, of the 6800 operating systems, and manufacturers of other operating systems these days take pains to remain MIKBUG-compatible. Such operating systems as SWTBUG, SMARTBUG and RT-68/MX all have the same I/O routines in the same locations, and all use the same tape punch format.

This has virtually locked the 6800 user into this format (Fig. 1). To output 16 bytes of data to tape, there is a "start of record"—the characters S1. Next comes the count of the number of bytes to follow.

And here is where MIKBUG slows down.

Nineteen (decimal) bytes will follow, so the computer punches that 13 (hex) bytes follow—but it punches a one and a three in ASCII. That is, for this and all succeeding bytes, it punches two characters. Following the count, there is the start address of the record (two bytes; four characters), and then 16 bytes of data (32 characters) and a checksum (two characters). Also, at the end there is a carriage return and line feed.

Total it up: to punch, or record on cassette, only 16 bytes, MIKBUG must output a total of 44 characters, or 2.75 characters for every byte of data. This is very wasteful overhead. If this overhead could be removed, cassette loading time (or TTY loading from paper tape) could be speeded up by a factor of 2.75.

Some suggested remedies, such as increasing the record length from 16 to 256 characters, or outputting a pseudo-binary (with the parity bit, bit 7, set to zero) record, have not completely succeeded. The best solution is to simply output straight binary data with as little overhead as possible.

Fig. 2 shows a scheme this author has used successfully. As in MIKBUG, an S1 is used as a start-of-record. Anything that occurs on the tape before this S1 is ignored. Then follows the start address for the record (four ASCII characters representing two bytes) and a space. Then follows, byte for byte, one character for one byte in the same order as in memory. Any number of bytes are punched—one byte, up to all of memory. When data is finished, an end-of record "S9R" is punched.

#### The Program BIPNCH

An assembly-language program named BIPNCH has been written to take care of

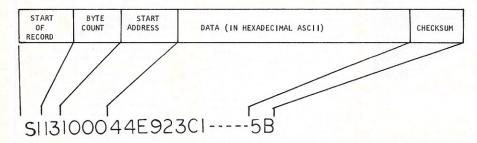


Fig. 1. MIKBUG punch format.

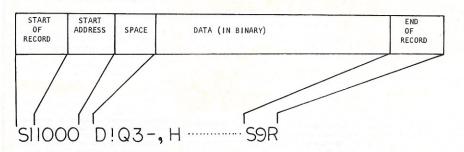


Fig. 2. BIPNCH punch format.

<b>BPUNCH</b>	\$7F00	Punch subroutine
DONE9	\$7F1D	Subroutine prints end of record
SECDEL	\$7F51	Subroutine delays one second
TLOOP	\$7F53	Subroutine delays a number of half-seconds equal to ACCB
BILOAD	\$7F62	Load subroutine
	\$7F9E	Reset MP-C PIA FOR ECHO
		Table 1

(MIKBUG Monitor) \* M A048 A048 DF 7F A049 13 2A A04A 22 !0100 01FF (punches \$0100-\$01FF) Sample Run 1.

data loading and punching in this binary format, and is shown in Program 1. The program was written for use on an SWTP 6800 micro using RT68/MX as an operating system. It presumes memory at \$A000, and that an MP-C control interface at \$8004 is used for communication to the terminal. However, as will be shown later, the program may be easily modified to other systems.

BIPNCH is an example of structured programming; that is, it is written as two monitor-called routines, and a series of subroutines.

The punch routine, BOUT, is called from the monitor by executing location \$7F2A. The program outputs a prompt (!) and waits for the user to input the start and end addresses of the region to be punched. When this is done, the program calls the punch subroutine to output headers, data and endof-record, and returns to the monitor. Sample run 1 shows how it works.

The loading routine, BIN, is called from the monitor by executing location \$7FAB. The program disables the MP-C echo and loads the data automatically, returning to the monitor when done.

Both routines will, of course, automatically start and stop the recorder if used with an AC-30 interface.

It should be noted that the punch routine, if used with a terminal and AC-30 interface. will cause characters to print on the screen. Control characters will cause controlled devices to actuate (including recorder on/off), so it is recommended that the control functions be deactuated when punching. On the CT-1024 terminal by SWTP, this may be done by adding a switch that disconnects pin 3 of IC8 on the CT-CA cursor control board. There is no difficulty during the read routine, since the echo is disabled.

	NAM BIPNCH
E07E E0CC E0C8 E047 E1D1 A016 A014 E0E3	PDATR1 EQU \$E07E OUTS EQU \$E0CC OUT4HS EQU \$E0C8 BADDR EQU \$E0C47 OUTEEE EQU \$E101 STADR EQU \$A016 ENADR EQU \$A014 CONTL EQU \$E0E3 **NOT STRIP PARITY BIT
E359	INEEE EQU \$E359
7F00	* ORG \$7F00
7F00 CE 7F B0 7F03 BD E0 7E 7F06 CE R0 16 7F09 BD E0 C8 7F0F FE R0 16 7F0F A6 00 7F11 BD E1 D1 7F14 BC R0 14 7F17 27 03 7F19 08 7F16 20 F3 7F16 39	*PUNCH SUBROUTINE BPUNCH LDX #OPHDR JSR PDF1741 LDX #STADR JSR OUT4HS LDX STADR MORE1 LDAR 8.X JSR OUTEEE CPX ENADR BEQ DONE1 INX BRA MORE1 DONE1 RTS *
7F1D CE 7F B3 7F20 BD E0 7E 7F23 8D 2C 7F25 86 14 7F27 7E E1 D1	*END OF RECORD DONE9 LDX #ESS9 JSR PDATR1 BSR SECDEL LDAA #\$14 JMP OUTEEE
7F2A CE 7F 87 7F2D 8D E0 7E 7F36 8D E0 47 7F33 FF A0 16 7F36 8D E0 64 7F36 FF A0 14 7F3F 8D 16 7F41 86 12 7F43 8D E1 D1 7F46 8D 09 7F48 8D B6 7F4R 8D D1 7F4C 8D 03 7F4C 8D 03 7F4C 7E E0 E3	**MONITOR CALL FOR *PUNCH ROUTINE BOUT LDX #PROMPT JSR PDATA1 JSR BADDR STX STADR JSR BADDR STX ENADR BSR SECDEL LDAA #\$12 JSR OUTSEE BSR SECDEL BSR BPUNCH BSR DONE9 BSR SECDEL JMP CONTL
7F51 C6 02 7F53 CE F4 FF 7F56 09	DECX DEX
7F57 26 FD 7F59 5A 7F5A 26 F7 7F5C 39	BNE DECX DECB BNE TLOOP RTS
<b>7</b> F5D 8D 8E <b>7F5</b> F 7E E6 E3	*MONITOR CALL TO *OUTPUT "S9R" DATA END S9 BSR DONE9 JMP CONTL  * *SUBROUTINE FOR
7F62 CE 7F BB	*BINARY DATA IN BILOAD LDX #RDON;
7F65 C6 3C 7F67 F7 80 07 7F6A BD E0 7E	*SET PIA NO ECHO LDAB #\$3C STAB #\$9087 JSR PDATA1 *INPUT DATA HEADER
7F6D BD E3 59 7F78 81 53 7F72 26 F9 7F74 BD E3 59 7F77 81 31 7F79 26 F2 7F78 BD E8 47	#INFOT DATH HENDER  RGAIN JSR INEEE  CMPA #/5  BNE AGAIN  JSR INEEE  CMPA #/1  BNE AGAIN  JSR BADDR

7F7B BD EØ 47

In addition to the two monitor call routines listed above, there are useraccessible subroutines which may be of value in other programs. They include the punch and load subroutines themselves. In MIKBUG, the user must go to the monitor to write to or read from tape, or write his or her own routines. Here, the routines are usable directly. To punch, load the start and end addresses to punch into \$A016 and \$A014, respectively, and jump to the subroutine at \$7F00. To load, or read a tape, jump to the subroutine at \$7F62. Table 1 is a list of subroutines, their locations and what they do. Note that a monitor-callable program

7F81	BD E3 59 81 20 26 E8	CMPA #\$20 BNE AGRIN
7F87 7F89	80 10 81 53 26 FA 80 17	*DATA INPUT MORE2 BSR INPUT CMPA #'S BNE MORE2 BSR INPUT
7F8D 7F8F 7F91	81 39 26 F4 8D 11	CMPR #/9 BNE MORE2 BSR INPUT CMPR #/R
7F99	81 52 26 EE 80 88 86 13 BD E1 D1	BNE MORE2 BSR SECDEL LDAA #\$13 JSR OUTEEE *PIA RESET
7FA0 7FA3 7FA4	BD E3 59	LDAB #\$34 STAB \$8007 RTS INPUT JSR INEEE
7FA7 7FA9 7FAA		STAR 0, X INX RTS *
	80 B5 7E E8 E3	*BINARY DATA INPUT BIN BSR BILOAD JMP CONTL
7FB0 7FB1 7FB2 7FB3	31 94	OPHDR FCC 'S1' FCB 4 ESS9 FCC 'S9R'
7FB6 7FB7	04 00	FCB 4 PROMPT FCB \$D, \$A, \$21, \$4
7FB8 7FB8 7FB8 7FBC		RDON FCB \$11,\$4
	NO ERROR	(S) DETECTED
SYP AGRIN	180L TABLE 7F6D	: BADDR E047
BILOAU BOUT CONTL DONE1 ENROR INEEE		BIN 7FAB BPUNCH 7F86 DECX 7F56 DONE9 7F1D ESS9 7FB3 INPUT 7FA4
MORE1 OPHDR OUTEEE PDRTA1 RDON SECDEL TLOOP	7F0F 7F86 E E101 L E67E 7F88	MORE2 7F85 OUT4HS EBC8 OUT5 EBCC PROMPT 7F87 S9 7F50 STADR 8816
am 1.		

# COMPUTER SYSTEMS



APPLE II, 16K,	L	IS	st	5	?	1	15	J!	)						Ş	989
32K, List \$1395															\$	1169
48K																1259

#### ATARI® 400<sup>TM</sup>, List \$630 OUR PRICE ONLY \$499

**820 PRINTER**, List \$599.95 . . . . \$499 **810 DISK DRIVE**, List \$699.95 . . . . **\$589** 



- Extended BASIC Language
- Advance Graphics
- CRT Built-In Display
- Magnetic Tape Cartridge for Storage

#### **CALCULATORS BY**



#### HEWLETT PACKARD

HP-41C Calculator, "A System" \$244.95
HP-32E Scientific w/Statistics \$ 53.95
HP-33C Scientific Programmable 99.95
HP-34C Advanced Scientific
Programmable 123.95
HP-37E Business Calculator 58.95
HP-67 Handheld Fully Advanced
Programmable Scientific for
Business & Engineering 298.95
HP-07 Desktop w/Built-in Printer . 579.95

#### COMMODORE PET ..... Call for Prices

Prices do not include shipping by UPS. All prices and offers are subject to change without notice.





**303** 

609 Butternut Street Syracuse, N.Y. 13208 (315) 478-6800

PDATA 1	\$E07E	Output data string terminated by EOT
		EUI
OUTS	\$EOCC	Output a space
OUT4HS	\$E0C8	Output 2 bytes in ASCII hex,
		with a space
BADDR	\$E047	Input 2 bytes in ASCII hex
OUTEEE	\$E1D1	Output a character from ACCA
CONTL	\$E0E3	Jump to monitor
		T-11-0
		Table 2.

places "S9R" at the end of a tape; this is useful even with MIKBUG.

#### How Does It Work?

In a word, magnificently. Instead of 22 minutes to load 8K BASIC, it now requires only eight minutes. It is possible to double the amount of work I get out of my machine.

The program fits very nicely into a 256  $\times$  8 1702A EPROM at \$7F00, with considerable room left over for other routines. Only four bytes of RAM are used at \$A014-\$A017, and the code is not self-modifying, so that it may be placed in EPROM.

#### **Modifications to Other Systems**

As stated above, the program may be easily modified for other 6800 systems.

If you desire to place the program into a location other the \$7F00, you may reassemble it to any other location, or modify the addresses of the instructions at \$7F00, \$7F1D, \$7F2A and \$7F62.

Virtually all the external routines in BIPNCH are MIKBUG-compatible. Table 2 lists these routines, and what they do. There should be no trouble with MIKBUG, SWTBUG, SMARTBUG or RT-68/MX.

If you are using an ACIA, rather than an MP-C control interface, the PIA echo/no echo routines at \$7F65 and \$7F9E must be rewritten

The only critical external routine which will require extensive modification is the character input routine. It was discovered that both MIKBUG and RT-68/MX strip the most significant bit (set bit 7 equal to zero) whenever a character is input via the subroutine INEEE at \$E1AC. Naturally, this is unacceptable, because when you save programs, approximately half the instruction bytes will have bit 7 equal to 1.

In RT-68/MX, the solution is simple. Enter the subroutine at \$E359, after the parity bit stripping function. Then the character is input exactly as recorded. For MIKBUG and SMARTBUG, however, the solution is not so simple. It is not possible to bypass the parity stripping so simply. I have no information on SWTBUG, but I presume it is similar.

For those who use these other monitors, Program 2 shows an input routine for MP-C interface which does not strip the parity bit. It is ORGed at \$E359, but is relocatable to

	NAM INEEE2							
	* *MP-C INPUT ROUTINE							
	*DOESN'T STRIP PARITY  *RELOCATABLE  *NON-REENTRANT							
	*INPUTS CHAR TO ACCA *FROM MP-C AT \$8004							
<b>A010</b> E359	XTEMP EQU \$8010 ORG \$E359							
E359 37 E35R FF A0 10	PSHB STX XTEMP							
E350 CE 80 04	LDX #\$8804							
	*WAIT FOR START BIT							
E360 A6 00	*AND START TIMER PIA LDAR 0, X							
E362 2B FC	BMI PIR							
E364 6F 02 E366 8D 22	CLR 2,X BSR BIT							
E368 8D 1C	BSR WAIT							
E36A C6 04 E36C E7 02	LDAB #4 STAB 2,X							
	* *INPUT 8 BITS							
E36E 58 E36F 8D 15	ASLB							
E36F 8D 15 E371 0D	PIA2 BSR WAIT SEC							
E372 69 00	ROL 0, X							
E374 46 E375 5R	RORA DECB							
E376 26 F7	BNE PIA2							
E378 8D 0C	* BSR WRIT							
	*TEST # STOP BITS							
E37A E6 02 E37C 58	CHECK LDAB 2, X ASLB							
E37D 2A 02	BPL RES							
E37F 8D 05	* BSR WAIT							
5304 E5 00 40	*RETURN							
E381 FE A0 10 E384 33	RES LDX XTEMP PULB							
E385 39	* RTS							
	*TIMERS							
E386 6D 02 E388 2R FC	WAIT TST 2,X BPL WAIT							
E388 60 02	BIT INC 2,X							
E38C 6A 02 E38E 39	DEC 2.X							
E30E 37	*							
NO ERROR	END (S) DETECTED							
SYMBOL TABLE BIT E38A	CHECK E37A							
PIR E360	PIR2 E36F							
RES E381 XTEMP 8010	MAIL E386							
P	rogram 2.							

any other location. I must emphasize that this is similar to, but not the same way as it is done in RT-68/MX, to avoid copyright violations.

Last, there are some difficulties with using the binary loading technique. I have pointed out the control character problem above. Just as serious is the lack of checksum. The program has no way of knowing if there were any loading errors.

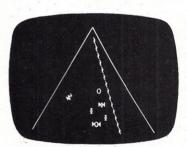
I must say, though, that in eight months of using the program, I have never had a bad load. Even if I did, it only takes a few minutes to re-load.

# FROM PROGRAMMA HI-RESOLUTION GRAPHICS FOR THE TRS-80®



LOWER CASE

The 80-GRAFIX board includes two sets of lower case characters at no additional cost.



DEMONSTRATION PROGRAMS

The 80-GRAFIX board is supplied with a Character Generator software and several demonstration programs.



FINALLY, AT LAST...

HI- RESOLUTION GRAPHICS is available for your TRS-80 computer system. The 80-GRAFIX board from PROGRAMMA International, Inc. gives your TRS-80 high resolution capability that is greater than the Commodore CBM/PET or even the revered APPLE II.

80-GRAFIX gives the TRS-80 an effective screen of 384X192 pixels, versus the normal 127X192 for the TRS-80, 80X50 for the CBM/PET, or the 280X192 of an APPLE II. As an added feature, 80-GRAFIX offers you lower case characters at no additional cost. Of course, you can also create your own set of up to 64 original characters using the supplied Character Generator software.

The 80-GRAFIX board is simple to install (note that this voids your Radio Shack warranty), and programming is done through BASIC. 80-GRAFIX opens up a whole new realm of software development and excitement never dreamed of for the TRS-801



**INVERSE VIDEO** 

The 80-GRAFIX board allows you to do inverse video to high-light your screen displays.



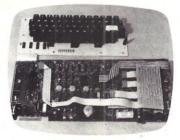
CHARACTER GENERATOR

The supplied character generator software allows you to create your own character set of up to 64 original characters.



**REAL-TIME GRAPHIC GAMES** 

With the 80-GRAFIX board you can write exciting real-time games using BASIC.



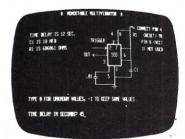
EASY INSTALLATION

The 80-GRAFIX board is simple to install and fits inside the TRS-80 case.



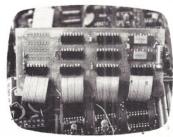
**GRAPHICS GALORE** 

The 80-GRAFIX board and the supplied Character Generator allow you to become an artist.



ELECTRONIC DESIGN

The 80-GRAFIX board has unlimited application in Electronic design and Education.



80-GRAFIX HI-RESOLUTION

Finally, the only means to protect your computer investment is to order an 80-GRAFIX board TODAY!



**EXCITEMENT & FUN** 

Open up a new realm of software development with the 80-GRAFIX board.

#### PROGRAMMA INTERNATIONAL, INC.

3400 Wilshire Blvd. Los Angeles, CA 90010

<u>-11</u> ...

(213) 384-0579 · 384-1116 · 384-1117

Available exclusively through PROGRAMMA at the cost of \$149.95 Please check with us for availability prior to ordering VISA and MASTERCHARGE accepted TRS-80 is a registered trademark of the Tandy Corp.

## PROGRAMMING TOOLS FOR YOUR TRS-80

INSIDE LEVEL II

The Programmers Guide to the TRS-80 ROMS

INSIDE LEVEL II is a comprehensive reference guide to the Level II ROMs which allows the machine language or Basic programmer to easily utilize the sophisticated routines they contain. Concisely explains set-ups, calling sequences, and variable passage for number conversion, arithmetic operations, and mathematical functions, as well as keyboard, tape, and video routines. Part II presents an entirely new composite program structure which loads under the SYSTEM command and executes in both Basic and machine code with the speed and efficiency of a compiler. In addition, the 18 chapters include a large body of other information useful to the programmer including tape formats, RAM useage, relocation of Basic programs, USR call expansion, creating SYSTEM tapes of your own programs, interfacing of Basic variables directly with machine code, a method of greatly increasing the speed at which data elements are stored on tape, and special precautions for disk systems. INSIDE LEVEL II is a clearly organized reference manual. It is fully typeset and packed with nothing but useful information. It does not contain questions and answers, ROM dumps, or cartoons. INSIDE LEVEL II....\$15.95

#### 4 SPEED OPTIONS FOR YOUR TRS-80!

The SK-2 is the most versatile clock modification available for the TRS-80. Speeds may be switched between normal, an increase of 50%, or a 50% reduction. Instructions are also given for a 100% increase to 3.54 MHz, though the TRS-80 is not reliable at this speed. Speed may be changed with a toggle switch or on software command. It will automatically return to normal speed any time a disk is active, requires no change to the operating system, and has provisions for adding an LED to indicate when the computer is not at normal speed. It mounts inside the keyboard unit with only 4 necessary connections for the switch option (switch not included), and is easily removed if the computer ever needs service. The SK-2 comes fully assembled with socketed IC's and illustrated instructions. SK-2.....\$24.95

#### TELECOMMUNICATIONS PROGRAM

This program allows reliable high speed file transfers between two disk-based computers over modems or direct wire. It is menu driven and extremely simple to use. Functions include real-time terminal mode, save RAM buffer on disk, transmit disk file, receive binary files, examine and modify UART parameters, program 8 custom log-on messages, automatic 16-bit checksum verification of accurate transmission and reception, and many more user conveniences. Supports line printers and lowercase characters. With this program you will no longer need to convert machine language programs to ASCII for transmission, and you will know immediately if the transmission was accurate. **TELCOM.....\$29.95** 

#### PROGRAM INDEX FOR DISK BASIC

Assemble an alphabetized index of your entire program library from disk directories. Program names and free space are read automatically (need not be typed in) and may be alphabetized with a fast Shell/Metzner sort by disk or program. The list may also be searched for any disk, program, or extension; disks or programs added or deleted; and the whole list or any part sent to the printer. Finally, the list itself may be stored on disk for future access and update. "The best thing since sliced bread" (January issue of '80 Microcomputing). One drive and 32K required. INDEX.....\$19.95

#### SINGLE STEP THROUGH RAM OR ROM

STEP80 allows you to step through any Basic or machine lan-guage program one instruction at a time, and see the address, hexadecimal value, Zilog mnemonic, register contents, and step count for each instruction. The top 14 lines of the video screen are left unaltered so that the "target program" may perform its display functions unobstructed. STEP80 will follow program flow right into the ROMs, and is an invaluable aid in learning how the ROM routines function. Commands include step (trace), disassemble, run in step mode at variable step rate, display or alter memory or CPU registers, jump to memory location, execute a CALL, set breakpoints in RAM or ROM, and relocate to any page in RAM. The display may also be routed to your line printer through the device control block so custom print drivers are automatically supported. STEP80.....\$16.95

ORDERING: Complete satisfaction is guaranteed or a full refund will be made. All programs are shipped on cassette unless \$5 is included for a formatted (no system) disk. Include \$1 postage and handling. California residents add 6% sales tax. Visa, Mastercharge and COD orders accepted.

#### MUMFORD MICRO SYSTEMS

Box 435-C Summerland, California 93067 (805) 969-4557

#### ANNOUNCING:

NEW!

#### MICROSTAT

A complete statistics package for business, scientific, education and research work. No other package has the features of MICROSTAT. For example:

- File oriented with COMPLETE editing
- A Data Management Subsystem for editing, sorting, ranking, lagging, data file transfers PLUS 11 data transformations (e.g., linear, reciprocal, exponential, etc.) • Frequency distributions • Simple and multiple regression • Time series (including exponential smooth-
- ing) 11 Non-parametric tests Crosstabs/Chi-square Factorials (up to 1,000,000!), permutations, combinations
- 8 Probability distributions Scatterplots
- Hypothesis test (Mean, proportion)
   ANOVA (one and two-way) • Correlation • Plus many other unique features

Users manual: \$10.00 (credited towards purchase) and includes sample data and printouts. Uses NORTH STAR BASIC 32K of memory, one or two disk drives (2 recommended). Printer optional. Price: \$200.00



#### ECOSOFT

Phone orders:

P.O. Box 68602 Indianapolis, IN 46268

(317) 253-6828



#### ♥♥♥♥♥▼▼▼ presents for the TRS-80\* PET, Apple II, and Apple II Plus

#### **ELECTORAL COLLEGE 1980**

The Tool for forecasting the outcome of the 1980 presidential Election. Will it be CARTER? REAGAN? ANDERSON? or will the election be forced into the House of Representatives? This program, developed by a professor of Political Science is built to be used in two ways:

1. During the political campaign prior to the election and,

2. On Election Night, as the partial returns roll in on network news. Using state by state data on previous elections that the program provides, simulated elections are run and the probability of outcomes calculated.

#### **COLLEGE BOARDS**

The best way to sharpen your skills for the College Board SAT Exams is to work on actual examinations. Each of these 4 programs confronts the user with a virtually limitless series of questions and answers. Each is based on past SAT exams and presents material of the same level of difficulty and in the same form as used in the verbal and mathematical portions of the College Board Examinations. Scoring on each exam is provided in accordance with the formula used by College Boards.

COLLEGE BOARD - VOCABULARY COLLEGE BOARD - WORD RELATIONSHIPS COLLEGE BOARD - MATH PART A COLLEGE BOARD - MATH PART B COMPLETE SET

19.95 19.95

59.95

#### TIME TRAVELER

The best of the adventure games. Confronts player with complex decision situations and at times, the demand for real time action. Using the time machine, players must face a challenging series of environments that include: the Athens of Pericles, Imperial Rome, Nebuchadnezzar's Babylon, Ikhnaton's Egypt, Jerusalem at the time of the crucifixion, the Crusades, Machiavelli's Italy, the French Revolution, the American Revolution and the English Civil War. Deal with Hitler's Third Reich, the Vikings, etc. Involve yourself with historical military and government operations, markets, etc. in fascinating game situations. Each game is

\*All programs require 16K • TRS-80 programs require Level II BASIC • Apple programs require Applesoft BASIC.

Send check or money order to Krell Software 21 Millbrook Drive, Stony Brook, NY 11790 (516) 751-5139

#### SPECIAL PRICES

We offer a complete selection of hardware, software, peripherals.



**OHIO SCIENTIFIC** VECTOR GRAPHICS **HEWLETT-PACKARD** COMMODORE PET

Immediate shipping. VISA/MC O.K. Contact us for a catalog, or our quote.

**Computer Distributors** 12704 North Freeway Houston, TX 77060 (713) 821-2702

**TRS-80** 

#### **SAVE A BUNDLE**

When you buy your TRS-80TM equipment!

Use our toll free number to check our price before you buy a TRS-80<sup>TM</sup> . . . anywhere!

full Radio Shack warranty



1412 WEST FAIRFIELD DR.

P.O. BOX 8098 PENSACOLA FL 32505 904/438-6507

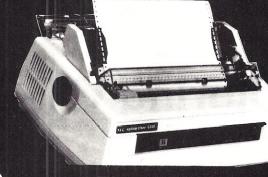
nationwide 1-800-874-1551

ΩMEGA SALES CO.

"WHOLESALE COMPUTER PRICES" DIRECT TO THE PUBLIC

12 Meeting St., Cumberland, R.I. 02864

PRODUCT SPECIAL



**NEC 5510 Printer** 2395 **Tractor Feed Option** \$180







Products are NOW IN STOCK AT  $\Omega$ MEGA Sales Co.







## CALL TOLL FREE FOR ΩMEGA'S PRICE!

ΩMEGA OFFERS THE BEST DELIVERY AND PRICE ON: APPLE • ATARI • TRS-80 MODEL II • INTERTEC • T.I. 810 • HEWLETT-PACKARD-85 • SOROC • COMMODORE • NEC • QUME • CENTRONICS

 $\Omega$ MEGA sells only factory fresh, top quality merchandise to our customers.  $\Omega$ MEGA will try to match any current advertised price with similar purchase conditions. Before you buy anywhere else  $\cdot$  be sure to call  $\Omega$ MEGA Sales Co. 1-401-722-1027 or

FREE 1-800-556-7586

ΩMEGA ships via UPS, truck, or air. COD's, VISA, Mastercharge accepted.



## **Exploring CT-82 Graphics**

## The author leads you on an expedition to uncover the capabilities of this SWTP video terminal.



Photo 1. CT-82 from the outside.

CLEAR GRAPHICS DOT—Turn off a pixel at the specified position.

INVERT GRAPHICS DOT—Invert a pixel at the specified graphics position.

SET GRAPHICS DOT—Turn on a pixel at the specified graphics position.

CLEAR GRAPHICS LINE—Clear the straight line between two specified points.

INVERT GRAPHICS LINE—Invert a straight line between two points, i.e., turn off each point that is on and turn on each point that is off

SET GRAPHICS LINE—Draw a straight line between two points.

PITCH DOWN GRAPHICS SCREEN—Roll the pixels on the screen downward one pixel position.

PITCH UP GRAPHICS SCREEN—Roll the pixels on the screen upward by one pixel position.

YAW LEFT GRAPHICS SCREEN—Shift the pixels on the screen left by one pixel position.

YAW RIGHT GRAPHICS SCREEN-Shift the pixels on the screen right by one pixel position.

Fig. 1. CT-82 graphics commands. (Note: A pixel is a picture element, the smallest addressable piece of data on the graphics screen.)

Phil Hughes PO Box 2847 Olympia, WA 98507

The CT-82 is a video terminal by Southwest Technical Products Corporation (see Photo 1). Internally, it is based on a 6802 microprocessor and a Motorola 6845 CRT controller IC (see Photo 2). In its normal mode, it can display either 16 or 20 lines of 82 alphanumeric characters each and support scrolling (when the last line on the screen is filled, all lines are rolled up to allow space for a new line). It features other capabilities not found in "dumb" terminals.

Additionally, the CT-82 supports graphics commands that allow you to draw and manipulate dots and lines on the screen. Each of these capabilities is exercised by sending a specific control sequence from the computer to the CT-82. Figure 1 lists the graphics commands supported by the CT-82.

#### TEST82

To get the feel of the graphics capabilities, I wrote an assembly-language program, TEST82 (see Listing 1), which allows me to use the set and clear commands for both dots and lines. This program sends the required sequence to put the CT-82 into its graphics mode and then prompts for a command. Figure 2 lists the commands recognized by TEST82. The display illustrated in Photo 3 was created by executing TEST82 and entering the following commands:

DL 0 0 183 0 Top line
DL 0 62 183 62 Bottom line
DL 0 0 0 62 Left side
DL 183 0 183 62 Right side
DL 20 0 60 60 Create
DL 60 0 20 60 X

Note that all of the assembly-language routines in this article were written using RRMAC from Ed Smith's Software Works. Also, they all reference an "include" file for Flex Interface addresses. (Flex is a disk operating system for the 6800 by Technical Systems Consultants.) Listing 2 is a dummy program that references the include file. This shows all the Flex entry equates and their values.

Internally, TEST82 is easy to follow. When initially entered (at label START), the CT-82 is put in the graphics mode by sending it the string SMSG. Scrolling is also disabled so that entering a carriage return on the command line (bottom line of the screen) will not cause the display to scroll up one line. The code starting at the label NEXTCMD gets a line of user input using the Flex subroutine INBUFF, saves the first input character in accumulator B, saves the second input character in accumulator A and then skips the spaces that should follow the commands.

The command is then analyzed, and control is passed to the appropriate routine—EXIT for the X command, CLEAR for the CS command, DRAW for the D command and ERASE for the E command. If the command is not valid, routine INPERR issues an error message, waits for a carriage return and then returns to the NEXTCMD

CS Clear screen
X Exit
DP X1 Y1 Draw point
EP X1 Y1 Erase point
DL X1 Y1 X2 Y2 Draw line
EL X1 Y1 X2 Y2 Erase line

Note: the screen is composed of 184 vertical columns of 66 pixels each. These pixels are numbered 0-183 from left to right and 0-65 from top to bottom. The X value in each command is the column number and the Y value is the row number. Rows 63 through 65 are not available as they are used as the command entry line.

Fig. 2. TEST82 commands.

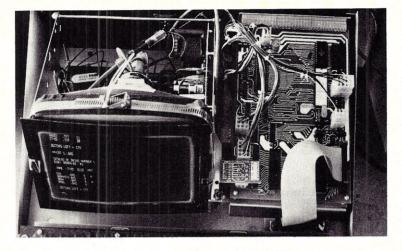


Photo 2. Inside view of the CT-82.

					Listing	1. TES	T	32.	
1		0000				NAM		TEST82	
2		0000				OPT		XRF, PNT	
3					* CT82 GR	APHICS		EST PROGE	RAM
4					* SSC 8-2	-79 V1		14	
138		0000				OPT		PNT	Y - Y
139		F1-4			*	F 0		VIE1541	HEED FOR ERECTAL CHICAGO
140		E101			OUTEEE	EQU		X'E1D1'	USED FOR SPECIAL CHARAC
141		0000			START	EQU		*	IERS
142	3 R	0000	CE	ODEB	OT AIR I	LDX		#SMSG	
143		0003				JSR		PSTRNG	
144	3 R	0006	CE	00F2	NEXTCMD	LDX		#PROMPT	
145		0009				JSR		PSTRNG	
146	21 *	000C	BD	AD1B		JSR		INBUFF	GET INPUT INTO LINE BUF FER
147	30 +	000F	a n	AD27		JSR		NXTCH	GET FIRST CHAR
148	34			03 (0017)		BCC		\$5	del lindi ciinn
149	3 R	0014	7E	0040		JMP		INPERR	BAD INPUT
150	2 R	0017	16		\$5	TAB			
151		0018		AD 27		JSR		NXTCH	GET POSSIBLE L OR P
152	15	001B		4027		PSH	Α	NYTC	SAVE
153	28 *	001C		AUZI		J S R PUL	Δ	NXTCH	SKIP BLANK
155	30	0020		43				#C'C'	CLEAR?
156	34	0022	26	07 (002B)		BNE		\$8	
157	2 R	0024	81	53		CMP	Α	# C ' S '	CS - CLEAR SCREEN ?
158	6			03 (002B)		BNE		\$8	
159	3 R			00B3	# 0	JMP	_	CLEAR	DRAHS
160	2 R	002B		03 (0032)	\$8	BNE	В	#C'D' \$10	DRAW?
162	3 R			0055		JMP		DRAW	NO
163	2 R	0032			\$10		В	#C'E'	ERASE?
164	6			03 (0039)		BNE		\$12	NO
165	3 R			0084		JMP		ERASE	
166	2 R	0039			\$12		В	#C'X'	EXIT?
168	6 3 R			03 (0040) 004¢		JMP		EXIT	
169	3 R			OOFF	INPERR	LDX		#IEMSG	
170		0043			1111 E KIK	JSR		PSTRNG	ERROR MESSAGE
171		0046				JSR		INBUFF	WAIT FOR CR
172	24			0006		JMP		NEXTCMD	
173	3 R			0125	EXIT	LDX		#RESMSG	RESET CT-82
174	12 *	004F		AD1E AD03		JSR		PSTRNG WARMS	RETURN TO FLEX
176	17	0032	1 5	ADUS	*	JMF		WARMS	RETORN TO FLEX
177		0055			DRAW	EQU		*	DRAW POINT OR LINE
178	2 R	0055	81	50			Α	#C'P'	
179	6			07 (0060)		BEQ		DRAW.PT	
180	2 R	0059					Α	#C'L'	
181	6 3 R			12 (006F) 0040		JMP		DRAW.LN INPERR	INPUT ERROR
183	9R*				DRAW.PT	JSR		INTWO	GET X AND Y
184	14			0149	J	LDX		X.AND.Y	GET X AND Y
185	20			012F		STX		DPX	SAVE IN STRING
186	23	0069	CE	0120		LDX		#DP	
187	26	0060	7 E	00B9		JMP		SEND	SEND IT
188		0045			*	EQU		*	*.
190	00+	006F	BD	0008	DRAW.LN	JSR		INFOUR	GET U, V, X, AND Y
191	14			0147		LDX		U.AND.V	GE1 3, V, A, AND 1
192	20			0134		STX		DLU	
193	25	0078	FE	0149		LDX		X.AND.Y	
194	31			0136		STX		DLX	
195	34			0132		LDX		#DL	
196 197	37	0081	/ E	00B9		JMP		SEND	
198		0084			ERASE	EQU		*	ERASE LINE OR POINT
199	2 R	0084	81	50			Α	#C'P'	POINT?
200	6	0086	27	07 (008F)		BEQ		ERS.PT	YES
201	. 2 R	0088	81	4 C				#C'L'	LINE?
202	6	008A	27	12 (009E) 0040		BEQ		ERS.LN	YES
203	3R 9R*	0086	BD	0040	ERS.PT	JMP		INPERR INTWO	ERROR GET X AND Y
205	14			0149	ENG.FI	LDX		X.AND.Y	GET A RIP I
206	20			013B		STX		EPX	
				0139		LDX			

208 209 210 211 212 213 214	26 9R* 14 20 25 31	009E 00A1 00A4 00A7 00AA	FF 014	.8 .7 .0 .9	ERS.LN	JMP JSR LDX STX LDX STX LDX	SEND INFOUR U.AND.V ELU X.AND.Y ELX #EL	GET U, V, X, AND Y
215 216 217 218 219	37 3R 6	00B0 00B3 00B3		39 2A	* CLEAR	JMP EQU LDX JMP	* #CLRMSG SEND	ERASE SCREEN
220 221 222	5 R	00B9	A6 00		* SEND	EQU LDA A	* 0,X	SEND STRING AND LOOP TO NEXT COMMAND GET CHARACTER
223 224 225 226 227 228	9 11 15 3R 9R*	00 C O	81 FF 26 03 7E 000 BD E10		<b>\$</b> 10	INX CMP A BNE JMP JSR BRA	#X'FF' \$10 NEXTCMD OUTEEE SEND	SPECIAL TERMINATOR? NO SEND IT
229 230		0008			* INFOUR	EQU	*	GET 4 DECIMAL NUMBERS U
231 232 233 234	9R* 14 23 * 28	00 CB	BD 008 B7 014 BD 008 B7 014	47 ≘1		JSR STA A JSR STA A	GETDEC U GETDEC V	v , x , Y
235		0004	00		INTWO	EQU	*	GET 2 DECIMAL NUMBERS X
236 237 238 239 240	9R* 14 23 * 28 33	00D7 00DA	BD 006 B7 014 BD 006 B7 014	¥9 ≣1		JSR STA A JSR STA A RTS	GETDEC EX GETDEC Y	X Y
241 242 243	9R*	00E1 00E1	BD AD	48	* GETDEC	E Q U J S R	* INDEC	RETURN VALUE IN A GET VALUE FROM LINE BUF FER
244 245 246	15 19 24		FF 014 B6 014 39			STX LDA A RTS	TEMP TEMP+1	SAVE GET L.O. BYTE
247 248 249 250 251 252		00ED 00EF 00F1	1016 0000 1E18 04 080015	5	* SMSG PROMPT	CON CON CON CON	DX'1D16' 0,0 DX'1E18' X'04' X'08',DX'0	PUT IN GRAPHICS MODE KILL SOME TIME DISABLE SCROLLING DO15' CURSOR POS
253 254 255 256 257		00 F F 0102 0112	0B0015 494E56 52455	040414E 5 6414C49 455524E	IEMSG	CON CON CON CON	C'INVALID	CLEAR TO END OF FRAME: ',x'04' 1015' CURSOR POS INPUT - ' TO CONTINUE',x'04' RESTORE FORMAT 1
258 259 260 261		0125 0127 0129 012A			RESMSG	CON CON CON	DX'1E08' X'04' DX'1C16'	ENABLE SCROLL  CLEAR TO BEGINNING OF F
262		0120	FF			CON	X'FF'	RAME
263 264 265 266			1013 0000 FF		DP DPX	CON CON	DX'1013' 0,0 X'FF'	DRAW PT. COMMAND
267 268 269 270 271		0134	1003 0000 0000 FF		* DLU DLX	CON CON CON	DX'1003' 0,0 0,0 X'FF'	DRAW LINE COMMAND U,V X,Y
272 273 274 275			1014 0000 FF		* EP EPX	CON CON	DX'1D14' 0,0 X'FF'	ERASE PT. COMMAND X,Y
276 277 278 279 280 281		0140	1004 0000 0000 FF		EL ELU ELX	CON CON CON	DX'1004' 0,0 0,0 X'FF'	ERASE LINE COMMAND U,V X,Y
282 283 284 285 286 287 288		0145 0147 0147 0148 0149 0149			TEMP U.AND.V U V X.AND.Y EX Y	RMB EQU RMB RMB EQU RMB RMB	2 * 1 1 * 1	
AD2	36 AD 21 CL 83 CL	ASS EAR	66 59 217 261	7 159	LAST	ENT END	START	
AD0 013 013 013 AD4 012 013	00 CO 32 DL 34 DL 36 DL 4B DO 2D DP 2F DP 65 DR	LDS U X CMND X AW	268 269 270 73 264 269 177 189	3 195 9 192 0 194 3 186 5 185 7 162 9 181				
013 014 014 013 013	50 DR. 3E EL. 40 EL. 42 EL. 39 EP. 38 EP. 84 ER. 96 ER.	U X X A S E	183 273 278 279 273 274 198 209	7 214 8 211 9 213 3 207 4 206 8 165				

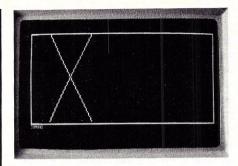


Photo 3. Sample run of TEST82.

loop.

Subroutine DRAW determines if the next character is an L or P. An L causes control to be transferred to DRAW.LN, which, in turn, calls INFOUR to get the coordinates and then draws a line. P causes control to be transferred to DRAW.PT, which calls INTWO to get the coordinates and then displays the specified point.

Note that the actual transmission of the control strings is performed by routine SEND. The Flex routine PSTRNG cannot be used because a control string could contain a hexadecimal 04, which acts as a string terminator. SEND uses a hexadecimal FF as the string terminator.

Subroutine ERASE works just like DRAW except the clear control string is sent instead of the set control string. ERS.PT erases a point, and ERS.LN erases a line. To output the control string, all of these routines use SEND, which transfers control back to NEXTCMD.

Subroutine CLEAR sends an erase-to-the-beginning-of-frame command to the CT-82. This is sufficient, since the cursor is on the last line of the screen, which will be changed by NEXTCMD anyway. EXIT restores the CT-82 to screen format 1 (82  $\times$  16 with standard ROM), enables scrolling and returns control to Flex.

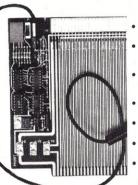
Once I had a chance to play with TEST82 and get a feel for the graphics potential of the CT-82, I decided it was time to interface these capabilities to BASIC. I could either write obscure subroutines in BASIC to send out the control strings or modify TEST82 to be callable from BASIC. I chose the latter approach because it would make the BASIC programs look more readable and be more efficient. Besides, some assembly language would be required anyway to handle the hexadecimal 04 control characters. Listing 3, program BAS82, was the result.

#### RASE

BAS82 differs from TEST82 in that it picks up its commands from the buffer pointed to by the contents of address 26 (hex) and has an added command, IN, which initializes the CT-82 to graphics mode. Otherwise, the two routines are essentially the

#### **MULLEN Computer Products**

# S-100 EXTENDER/LOGIC PROBE

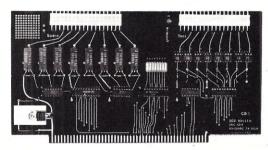


- New interlaced ground and signal traces, improves performance, reduces noise, with the new high clock frequency boards
- New brighter display, makes this very handy logic probe easier to use
- New proposed IEEE buss edge connector label, with all the fine quality documentation you expect with Mullen kits.
- High quality FR-4 board is double sided with plated thru holes and soldermasked for easy kit assembly
- Gold on all mating connector surfaces for better electrical contact
- Formed connector leads for easy scope probe attachment Jumper links in power lines makes cur-
- rent measurement and fusing easy
- Large "kluge" area lets you build and test your own circuits

TB-4 EXTENDER/LOGIC PROBE \$59. Kit \$79. Assm/tested

# CONTROLLER

- · 8 reed relay OUTPUTS
- 8 opto-isolated INPUTS
- · 256 selectable port addresses



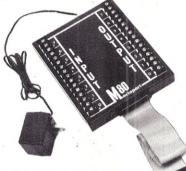
Our S-100 CONTROLLER is used in laboratories, at universities, and in industry, in hundreds of applications, and may be the answer to your control problem. Complete programming and operating instructions included.

For higher power applications a 500W AC POWER MODULE is available for \$15.

CB-1 CONTROLLER Kit \$129.

**MULLEN Computer Products** 

# CONTROL BOX



The M-80 OCTOPORT is a simple to use interface for the TRS-80 COMPUTER. You can control 8 external devices and sense 8 external conditions. Each output uses a reed relay and each input an opto-isolator to electrically isolate your TRS-80.

One or more controllers can be connected to either the interface connector or the screen printer con-

Each OCTOPORT is shipped completely assembled, tested and INCLUDES the interconnector cable, a UL approved power pack, and a 1 year warranty.

> M-80 OCTOPORT CONTROLLER \$159. Assm/tested

Use your TRS-80, and our M-80 control box to program control energy savings devices at home or in your business. Send for our free application notes today \*TRS-80 is a trademark of Tandy Radio Shack Corp.

## EXTENDER BOARD



Our HTB-0 lets H8 owners troubleshoot their boards faster and easier. Each board can be extended above the computer for complete access to all circuits and components.

#### **FEATURES**

- Sturdy 3/32" board
- Molex 25-pin edge connectors with formed leads for easy scope probe attachment
  - Jumper links in power lines makes current measurement and fusing easy

HTB-0 H8 EXTENDER

\*H8 is a trademark of Heath Company

\$39. Kit

#### **MULLEN COMPUTER PRODUCTS** BOX 6214, HAYWARD, CA 94544

OR PHONE (415) 783-2866 · VISA/MASTERCHARGE ACCEPTED. INCLUDE \$1.50 FOR SHIPPING & HANDLING. CALIFORNIA RESIDENTS ADD TAX.

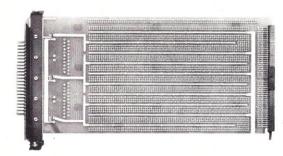
Order Direct or Contact your Local Computer Store.

#### KLUGE BOARD DESIGNED WITH YOUR PROTOTYPING PROBLEMS IN MIND.

#### PROTOTYPE BOARD

- Now available for the Heathkit H8
- Full-sized FR-4 board with heat sink/mounting brackets, buss connectors and polarizing key
- Designed for ease of external cable connection
- All plated thru holes .042" on .1" centers, power and ground

HKB-1 H8 PROTOTYPE BOARD \$30. Kit



PROTOTYPE KIT ACCESSORIES: if you wish to buy any of these accessories for your kit, please list parts and add price to total order. These parts may be ordered at any time, but an additional \$1.50 shipping and handling will be charged. . . . if ordered separately.

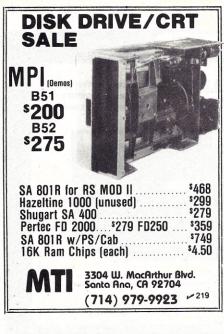
\$ 5.00

44-pin edge/cable connector

\$ 2.00 \$ 1.00 (1) 5 Volt regulator with (2) 39uF capacitors

\$ 1.00

(1) 25-pin Molex connector (90° male) (1) 25-pin Molex connector (female)



IN NEW YOR	RK CITY
OHIO SCIENTIF POLKS FULL STOO VICE ON CHALLEN COMPUTERS. CHALLENGER C1P 8K C1P 5" FLOPPY 20K SUPERBOARD C1P CHALLENGER (COLOR C4P FLOPPY 24K 5" CHALLENGER C8P COLOR-DUAL 8" FLOPP C-3 48K DUAL FLOPPY 18 C-2-0EM 48K DUAL FLOP PLUS ALL SOFTWARE 8	\$399.00 \$1250.00 \$1250.00 \$299.00 \$1795.00 \$1795.00 \$950.00 \$7 & \$4095.00 \$12,995.00 \$PY 8" \$2799.00
Mail order invited if m sent back to us for conversions available write for quote. Write log. M/C, VISA, AX CARI Aristo/Polks 314 5TH AVE.(32 ST) N.	service. 220V e for systems- e for free cata- DS ACCEPTED. 220 212-279-9034

0149	EX	287	237	000A	FEXT.PRT	135							
004C	EXIT	173	168		FEXT.SCR	131							
	F2BACK	8			FEXT.SYS	129							
	F2CCOL	39			FEXT.TXT	126							
		38			FL2IO	80							
	FZCOMF		100			99			1				
	F2CURC	26			FM2BOR								
	FZDEL	9	100		FM2CLF	84							
	F2DEPC	11		000C	FM2DLF	91							
ACO7	F2DX	15	- 300	0014	FM2FND	97							
ACO8	FZEJC	16	200	0007	FM2GIR	87							
AC2D	FZENV	41	600	0011	FM2GRB	95							
	FZEOL	10	1000		FM2NSS	93							
	F2ERR	25	0400		FM20PD	86							
			327										
	F2ERRT	32			FM20PR	81							
	FZESC	18			FM20PU	83							
A840	FZFCB	43	200	0002	FM20PW	82							
AC26	F2FIA	37		0010	FM20SI	9.4							
AC2F	F2FIEF	42		8000	FM2PIR	88							
	FZFOA	36			FM2POS	98							
	FZINSW	35			FM2PRB	96							
	FZLAST	22			FM2RNF	92							
AC14	F2LBP	24			FM2RSS	89							
A080	F2LBUF	7		0005	FM2RWF	85							
AC1B	FZLDAO	29		000A	FM2WSS	90							
	F2LINE	28	200	B400	FMINIT	74							
	FZMEND	40		B406		76							
	FZNULL	13	200		FMSCLS	75							
20.70					GETCHR	55							
	FZOTSW	34					271	277	236	238			
AC09	F2PAUS	17			GETDEC	242	231	233	230	230			
AC19	F2PREC	27			GETFIL	63							
ACOE	F2SDR	21		AD42	GETHEX	70							
	FZSDRV	19		OOFF	IEMSG.	255	169						
	F2SIOF	33		AD1B	INBUFF	57	146	171					
		14			INCH	51							
	F2TABC				INCH2	52							
	F2TRAN	30					243						
AC1E	F2TRNA	31			INDEC	72		200					
A100	FZUCA	44			INFOUR	230	190	209					
AC12	FZUCTA	23			INPERR	169	149	167	182	203			
	FZWDRV	20		0004	INTWO	235	183	204					
	FZWIDC	12		014B	LAST	290							
		105		AD30	LOAD	64							
	FB2ACT				NEXTCMD	144	172	226					
	FB2BUF	122			NXTCH	61	147	151	153				
	FB2CDA	119	100		OUTADR	71	141	131	1,75				
001E	FB2CUR	115											
0003	FB2DRV	106	535.54		OUTCH	53							
0013	FB2EDA	111	200		OUT CH2	54							
	FBZESB	104		AD39	OUTDEC	67							
	FBZEXT	108		E101	OUTEEE	140	227						
	FB2FAT	109		AD3C	OUTHEX	68							
		120			PCRLF	60							
	FB2FDP		100		PROMPT	252	144						
	FB2FLP	114			PSTRNG	58	143	145	170	174			
	FB2FNC	103					143	143	110	114			
0022	FB2INX	116			PUTCHR	56							
0004	FBZNAM	107			RENTER	50							
0024	FB2NWB	118	200	0125	RESMSG	258	173						
	FB2RDX	117		AD3F	RPTERR	69							
	FB2SCF	121		ADZA	RSTRIO	62							
					SEND	221	187	196	208	215	219	228	
	FB2SDA	110			SETEXT		101	170	200	-15	- 1 /		
	FB2SIZ	112	Control of the			65	1/2						
	FB2SMI	113			SMSG	248	142						
0008	FEXT.BAC	133			START	141	291						
0005	FEXT.BAK	130		0145	TEMP	282	244	245					
	FEXT.BAS	128		0147	U	284	232						
	FEXT.BIN	125		0147	U.AND.V	283	191	210					
	FEXT.CMD	127		0148		285	234						
		132			WARMS	49	175	-3					
	FEXT DAT				X.AND.Y	286	184	193	205	212			
	FEXT.DIR	134						173	203	212			
OUOB	FEXT.OUT	136		014A	1	288	239						

Z-80 USERS - would you like to use TRS-80\* Software? Our assembled interface and complete documentation allow you to load and interface TRS-80\* cassette programs. \$30.00



#### ¿COMPUPRISM? COLOR

GRAPHICS FOR THE \$-100 BUS. 16K OF ON BOARD MEMORY CAN BE USED AS RAM. 2 OR 4 MHz OPERATION. HIGH RESOLUTION (144 H. BY 192 V. PIXELS) WITH 16 COLORS AT THE SAME TIME. NO ADDRESS JUMPS MAKE PROGRAMMING EASY. SOCKETS FOR ALLI.C.'S. KIT \$240. AANDT \$280

Bare board with documentation \$45. ALL ORDERS SHIPPED COD WITHIN 72 HOURS. 4 MHz MOD FOR S.D. SYSTEMS. EXPANDORAM \$10. 16 CHANNEL A-D, 8 CHANNEL D-A FOR S-100 BUS, BARE BOARD WITH DOCUMENTATION \$30.

J.E.S. GRAPHICS P.O. BOX 2752 TULSA, OK. 74101 (918) 742-7104

2		*: O. FLEXE	QU.INC		
3	A080	F2LBUF	EQU	X'A080'	LINE BUFFER
4	ACOO	F2BACK	EQU	X'ACOO'	BACKSPACE CHARACTER
5	AC01	F2DEL	EQU	X'ACO1'	DELETE CHARACTER
6	ACO2	FZEOL	EQU	X'ACO2'	END OF LINE CHAR.
7	AC03	F2DEPC	EQU	X'AC03'	PAGE DEPTH COUNT
8	ACO4	FZWIDC	EQU	X'ACO4'	WIDTH COUNT
9	AC05	FZNULL	EQU	X'ACO5'	NULL COUNT
10	ACO6	FZTABC	EQU	X'AC06'	TAB CHARACTER
11	AC07	FZDX	EQU	X'AC07'	DUPLEX MODE
12	AC08	FZEJC	EQU	X'AC08'	EJECT COUNT
13	AC09	FZPAUS	EQU	X'AC09'	PAUSE CONTROL
14	ACOA	FZESC	EQU	X'ACOA'	ESCAPE CHARACTER
15	ACOB	FZSDRV	EQU	X'ACOB'	SYSTEM DRIVE NUMBER
16	ACOC	FZWDRV	EQU	X'ACOC'	WORKING DRIVE

Listing 2. Dummy program that shows all the Flex entry equates and their values.

0000

20

23

NAM DUMMY

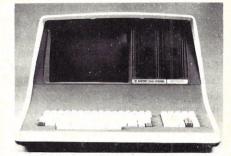
- FOR LIST OF FLEXEQU.I

N.C.

X'ACOE' X'AC11' X'AC12' ACOE F2SDR EQU 3 BYTE DATE REGISTER 18 19 AC11 F2LAST F2UCTA EQU LAST TERMINATOR
USER COMMAND TABLE ADDR AC12 ESS ESS
LINE BUFFER POINTER
ESCAPE RETURN REGISTER
CURRENT CHARACTER
PREVIOUS CHARACTER
CURRENT LINE NUMBER
LOADER ADDRESS OFFSET
TRANSFER FLAG
TRANSFER ADDRESS F2LBP X'AC14' X'AC16' X'AC18' X'AC19' X'AC1A' X'AC1B' AC16 AC18 AC19 F2ERR EQU F2CURC F2PREC EQU EQU 24 25 26 AC1A AC1B AC1D F2LINE F2LDAO F2TRAN EQU EQU 27 AC1E AC20 FZTRNA FZERRT EQU X'AC1E' X'AC20' ERROR TYPE
SPCIAL I/O FLAG
OUTPUT SWITCH
INPUT SWITCH EQU 29 30 AC21 X'AC21' X'AC22' F2SIOF EQU X'AC23' AC23 F2INSW EQU

32					
	AC24	FZFOA	EQU	X'ACZ4'	FILE OUTPUT ADDRESS
33	AC26	F2FIA	EQU	X'AC26'	FILE INPUT ADDRESS
34	AC28	FZCOMF	EQU	X'AC28'	COMMAND FLAG
35	AC29	FZCCOL	EQU	X'AC29'	CURRENT OUTPUT COLUMN
36	AC2B	FZMEND	EQU	X'ACZB'	MEMORY END
37	AC2D	F2ENV	EQU	X'ACZD'	ERROR NAME VECTOR
38	AC2F	F2F1EF	EQU	X'ACZF'	FILE INPUT ECHO FLAG
39	A840	F2FCB	EQU	X'A840'	SYSTEM FCB
40	A100	FZUCA	EQU	X'A100'	UTILITY COMMAND AREA
41		*			
42		* FLEX SUB	ROUTIN	NES	
43		*		w.L	COLDETADT SHIPM
44	AD00	COLDS	EQU	X'AD00'	COLDSTART ENTRY
45	AD03	WARMS	EQU	X ' AD03'	WARM START ENTRY
46	ADO6	RENTER	EQU	X'AD06'	MAIN LOOP RE-ENTRY
47	AD09	INCH	EQU	X'AD09'	INPUT CHAR INPUT CHAR
48	ADOC	INCH2	EQU	X'ADOC' X'ADOF'	OUTPUT CHAR
49	ADOF	OUTCH OUTCH2	EQU	X'ADDIZ'	OUTPUT CHAR
50 51	AD12 AD15	GETCHR	EQU	X'AD15'	PREFERRED GET CHAR
52	AD18	PUTCHR	EQU	X'AD18'	PREFERRED PUT CHAR
53	AD1B	INBUFF	EQU	X'AD1B'	INPUT TO LINE BUFFER
54	AD1E	PSTRNG	EQU	X'AD1E'	PRINT STRING
55	AD21	CLASS	EQU	X'AD21'	CLASSIFY CHARACTER
56	AD24	PCRLF	EQU	X'AD24'	PRINT CR, LF
57	AD27	NXTCH	EQU	X'AD27'	NEXT CHARACTER
58	ADZA	RSTRIO	EQU	X'ADZA'	RESTORE I/O VECTORS
59	ADZD	GETFIL	EQU	X'ADZD'	PARSE FILE SPEC.
60	AD30	LOAD	EQU	X'AD30'	FILE LOADER
61	AD33	SETEXT	EQU	X'AD33'	SET EXTENSION
62	AD36	ADDBX	EQU	X'AD36'	ADD ACC-B TO X
63	AD39	OUTDEC	EQU	X'AD39'	OUTPUT DECIMAL NUMBER
64	AD3C	OUTHEX	EQU	X'AD3C'	OUTPUT HEX CHARACTER
65	AD3F	RPTERR	EQU	X'AD3F!	REPORT ERROR
66	AD42	GETHEX	EQU	X'AD42'	GET HEX NUMBER
67	AD45	OUTADR	EQU	X'AD45'	OUTPUT HEX ADDRESS
68	AD48	INDEC	EQU	X'AD48'	INPUT DECIMAL NUMBER
69	AD4B	DOCMND	EQU	X'AD4B'	CALL DOS
70	B400	FMINIT	EQU	X'B400'	FMS INITIALIZATION
71	B403	FMSCLS	EQU	X'B403'	FMS CLOSE
72	B406	FMS	EQU	X'B406'	FMS CALL
73		* 546 6044			
74		* FMS COMM	ANDS		
75	0000	FL2I0	EQU	x'0'	READ/WRITE NEXT BYTE
76 77	0000	FM20PR	EQU	X'1'	OPEN FOR READ
78	0002	FM20PW	EQU	x'2'	OPEN FOR WRITE
79	0002	FM20PU	EQU	x'3'	OPEN FOR UPDATE
80	0004	FM2CLF	EQU	X'4!	CLOSE FILE
81	0005	FMZRWF	EQU	X'5'	REWIND FILE
82	0006	FM20PD	EQU	X'6'	OPEN DIRECTORY
83	0007	FM2GIR	EQU	X'7'	GET INFORMATION RECORD
84	0008	FM2PIR	EQU	X'8'	PUT INFORMATION RECORD
85	0009	FMZRSS	EQU	X'9'	READ SINGLE SECTOR
86	000A	FM2WSS	EQU .	X'A'	WRITE SINGLE SECTOR
87	000c	FM2DLF	EQU	X'C'	DELETE FILE
88	0000	FMZRNF	EQU	X'D'	RENAME FILE
89	000F	FMZNSS	EQU	X'F'	NEXT SEQUENTIAL SECTOR
90	0010	FM20SI	EQU	x'10'	OPEN SYSTEM INFORMATION
The same of the sa			nguess	Augustin for	RECORD
91	0011	FM2GRB	EQU	x'11'	GET RANDOM BYTE FROM SE
0.3	0043	5 M 3 0 0 0	5011	v1121	CTOR
92	0012	FMZPRB	EQU	X'12'	PUT RANDOM BYTE IN SECT
0.7	0017	FMZFND	EQU	X'14'	FIND NEXT DRIVE
93	0014 0015	FM2PND FM2POS	EQU	X'15'	POSITION BY RECORD
94 95	0016	FM2BOR	EQU	X'16'	BACKUP 1 RECORD
96	0010	- PMZBOK	Edo	× 10	BACKOT I RECORD
97					FICATIONS
98		* FILE CON	ITROL	BLOCK SPECI	
99		* FILE CON	ITROL	BLOCK SPECI	EFICATIONS
77	0000		EQU	O SPECI	FMS COMMAND
100	0000 0001	*		0	
100 101	0001 0002	* FB2FNC FB2ESB FB2ACT	EQU EQU EQU	0 1 2	FMS COMMAND ERROR STATUS ACTIVITY STATUS
100 101 102	0001 0002 0003	* FB2FNC FB2ESB FB2ACT FB2DRV	EQU EQU EQU EQU	0 1 2 3	FMS COMMAND ERROR STATUS ACTIVITY STATUS DRIVE NUMBER
100 101 102 103	0001 0002 0003 0004	* FB2FNC FB2ESB FB2ACT FB2DRV FB2NAM	EQU EQU EQU EQU	0 1 2 3 4	FMS COMMAND ERROR STATUS ACTIVITY STATUS DRIVE NUMBER FILE NAME (8 BYTES)
100 101 102 103 104	0001 0002 0003 0004 000c	* FB2FNC FB2ESB FB2ECT FB2DRV FB2NAM FB2EXT	EQU EQU EQU EQU EQU	0 1 2 3 4 12	FMS COMMAND ERROR STATUS ACTIVITY STATUS DRIVE NUMBER FILE NAME (8 BYTES) EXTENSION (3 BYTES)
100 101 102 103 104 105	0001 0002 0003 0004 000C	# FB2FNC FB2ESB FB2ACT FB2DRV FB2NAM FB2EXT FB2FAT	EQU EQU EQU EQU EQU EQU	0 1 2 3 4 12	FMS COMMAND ERROR STATUS ACTIVITY STATUS DRIVE NUMBER FILE NAME (8 BYTES) EXTENSION (3 BYTES) FILE ATTRIBUTES
100 101 102 103 104 105 106	0001 0002 0003 0004 000C 000F	# FB2FNC FB2ESB FB2ACT FB2DRV FB2NAM FB2EXT FB2FAT FB2FAT FB2SDA	EQU EQU EQU EQU EQU EQU EQU	0 1 2 3 4 12 15	FMS COMMAND ERROR STATUS ACTIVITY STATUS DRIVE NUMBER FILE NAME (8 BYTES) EXTENSION (3 BYTES) FILE ATTRIBUTES STARTING DISK ADDRESS
100 101 102 103 104 105	0001 0002 0003 0004 000C	# FB2FNC FB2ESB FB2ACT FB2DRV FB2NAM FB2EXT FB2FAT FB2SDA FB2SDA FB2EDA	EQU EQU EQU EQU EQU EQU	0 1 2 3 4 12 15 17	FMS COMMAND ERROR STATUS ACTIVITY STATUS DRIVE NUMBER FILE NAME (8 BYTES) EXTENSION (3 BYTES) FILE ATTRIBUTES STARTING DISK ADDRESS ENDING DISK ADDRESS
100 101 102 103 104 105 106 107	0001 0002 0003 0004 000C 000F 0011 0013	# FB2FNC FB2ESB FB2ACT FB2DRV FB2NAM FB2EXT FB2FAT FB2FAT FB2SDA	EQU EQU EQU EQU EQU EQU EQU EQU	0 1 2 3 4 12 15	FMS COMMAND ERROR STATUS ACTIVITY STATUS DRIVE NUMBER FILE NAME (8 BYTES) EXTENSION (3 BYTES) FILE ATTRIBUTES STARTING DISK ADDRESS
100 101 102 103 104 105 106 107 108	0001 0002 0003 0004 000C 000F 0011 0013	# FB2FNC FB2ESB FB2ACT FB2DRV FB2NAM FB2EXT FB2FAT FB2FAT FB2SDA FB2EDA FB2SIZ	EQU EQU EQU EQU EQU EQU EQU EQU EQU	0 1 2 3 4 12 15 17 17 19 21	FMS COMMAND ERROR STATUS ACTIVITY STATUS DRIVE NUMBER FILE NAME (8 BYTES) EXTENSION (3 BYTES) FILE ATTRIBUTES STARTING DISK ADDRESS ENDING DISK ADDRESS FILE SIZE
100 101 102 103 104 105 106 107 108	0001 0002 0003 0004 000C 000F 0011 0013	# FB2FNC FB2ESB FB2ACT FB2DRV FB2NAM FB2EXT FB2FAT FB2FAT FB2SDA FB2EDA FB2SIZ	EQU EQU EQU EQU EQU EQU EQU EQU EQU	0 1 2 3 4 12 15 17 17 19 21	FMS COMMAND ERROR STATUS ACTIVITY STATUS DRIVE NUMBER FILE NAME (8 BYTES) EXTENSION (3 BYTES) FILE ATTRIBUTES STARTING DISK ADDRESS ENDING DISK ADDRESS FILE SIZE FILE SECTOR MAP INDICAT
100 101 102 103 104 105 106 107 108 109	0001 0002 0003 0004 000c 000F 0011 0013 0015	# FB2FNC FB2ESB FB2ACT FB2DRV FB2NAM FB2EXT FB2FAT FB2SDA FB2EDA FB2SDA FB2SDA	EQU EQU EQU EQU EQU EQU EQU EQU EQU EQU	0 1 2 3 4 12 15 17 17 19 21 23	FMS COMMAND ERROR STATUS ACTIVITY STATUS DRIVE NUMBER FILE NAME (8 BYTES) EXTENSION (3 BYTES) FILE ATTRIBUTES STARTING DISK ADDRESS ENDING DISK ADDRESS FILE SIZE FILE SECTOR MAP INDICAT OR
100 101 102 103 104 105 106 107 108 109	0001 0002 0003 0004 000c 000F 0011 0013 0015 0017	FBZFNC FBZESB FBZACT FBZDRV FBZNAM FBZEXT FBZFAT FBZSDA FBZEDA FBZSIZ FBZSMI	EQU EQU EQU EQU EQU EQU EQU EQU EQU EQU	0 1 2 3 4 1 15 17 17 19 21 23	FMS COMMAND ERROR STATUS ACTIVITY STATUS DRIVE NUMBER FILE NAME (8 BYTES) EXTENSION (3 BYTES) FILE ATTRIBUTES STARTING DISK ADDRESS ENDING DISK ADDRESS FILE SIZE FILE SECTOR MAP INDICAT OR FCB LIST POINTER
100 101 102 103 104 105 106 107 108 109 110 111 112 113	0001 0002 0003 0004 000c 000F 0011 0013 0015 0017	FBZFNC FBZESB FBZACT FBZDRV FBZNAM FBZEXT FBZFAT FBZSDA FBZSDA FBZSIZ FBZSNI FBZSUR FBZSNI	EQU EQU EQU EQU EQU EQU EQU EQU EQU EQU	0 1 2 3 4 1 15 17 19 21 23 28 30 34 35	FMS COMMAND ERROR STATUS ACTIVITY STATUS DRIVE NUMBER FILE NAME (8 BYTES) EXTENSION (3 BYTES) FILE ATTRIBUTES STARTING DISK ADDRESS ENDING DISK ADDRESS FILE SIZE FILE SECTOR MAP INDICAT OR FCB LIST POINTER CURRENT POSITION DATA INDEX RANDOM INDEX
100 101 102 103 104 105 106 107 108 109 110 111 112 113 114	0001 0002 0003 0004 000c 000F 0011 0013 0015 0017	FB2FNC FB2ESB FB2ACT FB2DRV FB2NAM FB2EXT FB2FAT FB2SDA FB2SDA FB2SIZ FB2SMI FB2FLP FB2CUR FB2INX FB2RDX FB2RDX FB2RDX FB2RDX	EQU EQU EQU EQU EQU EQU EQU EQU EQU EQU	0 1 2 3 4 12 15 17 19 21 23 28 30 34 35 36	FMS COMMAND ERROR STATUS ACTIVITY STATUS DRIVE NUMBER FILE NAME (8 BYTES) EXTENSION (3 BYTES) FILE ATTRIBUTES STARTING DISK ADDRESS ENDING DISK ADDRESS FILE SIZE FILE SECTOR MAP INDICAT OR FCB LIST POINTER CURRENT POSITION DATA INDEX RANDOM INDEX NAME WORK BUFFER
100 101 102 103 104 105 106 107 108 109 110 111 112 113	0001 0002 0003 0004 000c 000F 0011 0013 0015 0017	FBZFNC FBZESB FBZACT FBZDRV FBZNAM FBZEXT FBZFAT FBZSDA FBZSDA FBZSIZ FBZSNI FBZSUR FBZSNI	EQU EQU EQU EQU EQU EQU EQU EQU EQU EQU	0 1 2 3 4 1 15 17 19 21 23 28 30 34 35	FMS COMMAND ERROR STATUS ACTIVITY STATUS DRIVE NUMBER FILE NAME (8 BYTES) EXTENSION (3 BYTES) FILE ATTRIBUTES STARTING DISK ADDRESS ENDING DISK ADDRESS FILE SIZE FILE SECTOR MAP INDICAT OR FCB LIST POINTER CURRENT POSITION DATA INDEX RANDOM INDEX NAME WORK BUFFER CURRENT DIRECTORY ADDRE
100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115	0001 0002 0003 0004 000c 000F 0011 0013 0015 0017 001C 001E 0022 0023 0024	FB2FNC FB2ESB FB2ACT FB2DRV FB2NAM FB2EXT FB2FAT FB2SDA FB2SDA FB2SIZ FB2SU FB2SU FB2SU FB2SU FB2SU FB2FLP FB2CUR FB2CUR FB2CUR FB2CUR FB2CUR		0 1 2 3 4 1 15 17 19 21 23 28 30 34 35 36 47	FMS COMMAND ERROR STATUS ACTIVITY STATUS DRIVE NUMBER FILE NAME (8 BYTES) EXTENSION (3 BYTES) FILE ATTRIBUTES STARTING DISK ADDRESS ENDING DISK ADDRESS FILE SIZE FILE SECTOR MAP INDICAT OR FCB LIST POINTER CURRENT POSITION DATA INDEX NAME WORK BUFFER CURRENT DIRECTORY ADDRE SS
100 101 102 103 104 105 106 107 108 109 110 111 112 113 114	0001 0002 0003 0004 000c 000F 0011 0013 0015 0017	FB2FNC FB2ESB FB2ACT FB2DRV FB2NAM FB2EXT FB2FAT FB2SDA FB2SDA FB2SIZ FB2SMI FB2FLP FB2CUR FB2INX FB2RDX FB2RDX FB2RDX FB2RDX	EQU EQU EQU EQU EQU EQU EQU EQU EQU EQU	0 1 2 3 4 12 15 17 19 21 23 28 30 34 35 36	FMS COMMAND ERROR STATUS ACTIVITY STATUS DRIVE NUMBER FILE NAME (8 BYTES) EXTENSION (3 BYTES) FILE ATTRIBUTES STARTING DISK ADDRESS ENDING DISK ADDRESS FILE SIZE FILE SECTOR MAP INDICAT OR FCB LIST POINTER CURRENT POSITION DATA INDEX RANDOM INDEX NAME WORK BUFFER CURRENT DIRECTORY ADDRE SS FIRST DELETED DIRECTORY
100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115	0001 0002 0003 0004 0005 0011 0013 0015 0017 0016 0022 0023 0024 0025	# FBZFNC FBZESB FBZACT FBZDXV FBZNAM FBZEXT FBZFAT FBZSDA FBZEDA FBZSIZ FBZSMI  FBZFLP FBZCUR FBZFLP FBZCUR FBZINX FBZRDX FBZRDX FBZRDX FBZRDX FBZRDX FBZRDA	EQU EQU EQU EQU EQU EQU EQU EQU EQU EQU	0 1 2 3 4 1 15 17 17 19 21 23 28 30 34 35 36 47	FMS COMMAND ERROR STATUS ACTIVITY STATUS DRIVE NUMBER FILE NAME (8 BYTES) EXTENSION (3 BYTES) FILE ATTRIBUTES STARTING DISK ADDRESS ENDING DISK ADDRESS FILE SIZE FILE SECTOR MAP INDICAT OR FCB LIST POINTER CURRENT POSITION DATA INDEX NAME WORK BUFFER CURRENT DIRECTORY ADDRE SS FIRST DELETED DIRECTORY POINTER
100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115	0001 0002 0003 0004 000c 000F 0011 0013 0015 0017 001C 001E 0022 0023 0024 002F	FB2FNC FB2ESB FB2ACT FB2ESN FB2ENAM FB2EXT FB2FAT FB2FAT FB2SDA FB2SDA FB2SIZ FB2SUA FB2SIZ FB2SNI FB2FLP FB2CUR FB2CUR FB2CUR FB2CUR FB2CUR FB2CUR FB2CUR FB2CUR FB2TDX FB2RDX FB2RDX FB2RDX FB2RDX FB2RDA	EQU EQU EQU EQU EQU EQU EQU EQU EQU EQU	0 1 2 3 4 1 15 17 19 21 23 28 30 34 35 36 47	FMS COMMAND ERROR STATUS ACTIVITY STATUS DRIVE NUMBER FILE NAME (8 BYTES) EXTENSION (3 BYTES) FILE ATTRIBUTES STARTING DISK ADDRESS ENDING DISK ADDRESS FILE SIZE FILE SECTOR MAP INDICAT OR FCB LIST POINTER CURRENT POSITION DATA INDEX RAMDOM INDEX RAME WORK BUFFER CURRENT DIRECTORY ADDRE SS FIRST DELETED DIRECTORY POINTER
100 101 102 103 104 105 106 107 108 109 111 112 113 114 115	0001 0002 0003 0004 0005 0011 0013 0015 0017 0016 0022 0023 0024 0025	# FBZFNC FBZESB FBZACT FBZDXV FBZNAM FBZEXT FBZFAT FBZSDA FBZEDA FBZSIZ FBZSMI  FBZFLP FBZCUR FBZFLP FBZCUR FBZINX FBZRDX FBZRDX FBZRDX FBZRDX FBZRDX FBZRDA	EQU EQU EQU EQU EQU EQU EQU EQU EQU EQU	0 1 2 3 4 1 15 17 17 19 21 23 28 30 34 35 36 47	FMS COMMAND ERROR STATUS ACTIVITY STATUS DRIVE NUMBER FILE NAME (8 BYTES) EXTENSION (3 BYTES) FILE ATTRIBUTES STARTING DISK ADDRESS ENDING DISK ADDRESS FILE SIZE FILE SECTOR MAP INDICAT OR FCB LIST POINTER CURRENT POSITION DATA INDEX NAME WORK BUFFER CURRENT DIRECTORY ADDRE SS FIRST DELETED DIRECTORY POINTER
100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116	0001 0002 0003 0004 000c 000F 0011 0013 0015 0017 001C 001E 0022 0023 0024 002F	# FBZFNC FBZESB FBZACT FBZESB FBZACT FBZDAW FBZEXT FBZSDA FBZEDA FBZSIZ FBZSMI FBZFLP FBZCUR FBZINX FBZRDX FBZNWB FBZCDA FBZEDA FBZEDD FFBZEDD FFBZEDD FFBZEDD FFBZEDD FFBZEDD FFFD FBZEDD FFFD FBZEDD FFFD FBZEDD FFFT FBZEDD FFFT FBZEDD FFFT FBZEDD FFFT FBZEDD FFFT FBZEDD FFFT FFFT FFFT FFFT FFFT FFFT FFFT F	EQU EQU EQU EQU EQU EQU EQU EQU EQU EQU	0 1 2 3 4 1 15 17 17 19 21 23 28 30 34 35 36 47 50	FMS COMMAND ERROR STATUS ACTIVITY STATUS DRIVE NUMBER FILE NAME (8 BYTES) EXTENSION (3 BYTES) FILE ATTRIBUTES STARTING DISK ADDRESS ENDING DISK ADDRESS FILE SIZE FILE SECTOR MAP INDICAT OR FCB LIST POINTER CURRENT POSITION DATA INDEX RAMDOM INDEX RAME WORK BUFFER CURRENT DIRECTORY ADDRE SS FIRST DELETED DIRECTORY POINTER
100 101 102 103 104 105 106 107 108 109 111 112 113 114 115	0001 0002 0003 0004 000c 000F 0011 0013 0015 0017 001C 001E 0022 0023 0024 002F	* FB2FNC FB2ESB FB2ACT FB2ESD FB2AM FB2EXT FB2FAT FB2SDA FB2SDA FB2SIZ FB2SMI  FB2FNC FB2INX FB2CUR FB2INX FB2CUR FB2INX FB2RDX FB2RDX FB2RDX FB2RDX FB2RDX FB2RDX FB2CDA  FB2FDP  FB2FDP  FB2SCF FB2BUF  * FILE EXT	EQU EQU EQU EQU EQU EQU EQU EQU EQU EQU	0 1 2 3 4 1 15 17 17 19 21 23 28 30 34 35 36 47 50	FMS COMMAND ERROR STATUS ACTIVITY STATUS DRIVE NUMBER FILE NAME (8 BYTES) EXTENSION (3 BYTES) FILE ATTRIBUTES STARTING DISK ADDRESS ENDING DISK ADDRESS FILE SIZE FILE SECTOR MAP INDICAT OR FCB LIST POINTER CURRENT POSITION DATA INDEX RAMDOM INDEX RAME WORK BUFFER CURRENT DIRECTORY ADDRE SS FIRST DELETED DIRECTORY POINTER
100 101 102 103 104 105 106 107 108 109 111 112 113 114 115 116	0001 0002 0003 0004 000c 000F 0011 0013 0015 0017 001c 001E 0022 0023 0024 002F	# FBZFNC FBZESB FBZACT FBZESB FBZACT FBZDAW FBZEXT FBZSDA FBZEDA FBZSIZ FBZSMI FBZFLP FBZCUR FBZINX FBZRDX FBZNWB FBZCDA FBZEDA FBZEDD FFBZEDD FFBZEDD FFBZEDD FFBZEDD FFBZEDD FFFD FBZEDD FFFD FBZEDD FFFD FBZEDD FFFT FBZEDD FFFT FBZEDD FFFT FBZEDD FFFT FBZEDD FFFT FBZEDD FFFT FFFT FFFT FFFT FFFT FFFT FFFT F	EQU EQU EQU EQU EQU EQU EQU EQU EQU EQU	0 1 2 3 4 1 15 17 19 21 23 28 30 34 35 36 47 50	FMS COMMAND ERROR STATUS ACTIVITY STATUS DRIVE NUMBER FILE NAME (8 BYTES) EXTENSION (3 BYTES) FILE ATTRIBUTES STARTING DISK ADDRESS ENDING DISK ADDRESS FILE SIZE FILE SECTOR MAP INDICAT OR FCB LIST POINTER CURRENT POSITION DATA INDEX RAMDOM INDEX RAME WORK BUFFER CURRENT DIRECTORY ADDRE SS FIRST DELETED DIRECTORY POINTER
100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115	0001 0002 0003 0004 0006 000F 0011 0013 0015 0017 001C 001E 0022 0023 0024 002F	* FBZFNC FBZESB FBZACT FBZESC FBZNAM FBZEXT FBZSDA FBZEDA FBZSIZ FBZSMI  FBZFLP FBZCUR FBZFLP FBZCUR FBZINX FBZRNX FBZRNX FBZRDX	EQU EQU EQU EQU EQU EQU EQU EQU EQU EQU	0 1 2 3 4 1 15 17 17 19 21 23 28 30 34 35 36 47 50	FMS COMMAND ERROR STATUS ACTIVITY STATUS DRIVE NUMBER FILE NAME (8 BYTES) EXTENSION (3 BYTES) FILE ATTRIBUTES STARTING DISK ADDRESS ENDING DISK ADDRESS FILE SIZE FILE SECTOR MAP INDICAT OR FCB LIST POINTER CURRENT POSITION DATA INDEX RAMDOM INDEX RAME WORK BUFFER CURRENT DIRECTORY ADDRE SS FIRST DELETED DIRECTORY POINTER
100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116	0001 0002 0003 0004 0005 0011 0013 0015 0017 001C 001E 0022 0023 0024 002F 0032	* FBZFNC FBZESB FBZACT FBZESB FBZACT FBZDAW FBZENAM FBZEDA FBZSDA FBZSIZ FBZSMI  FBZFAT FBZSDA FBZEDA FBZSIZ FBZSMI  FBZFLP FBZCUR FBZINX FBZENX FBZENX FBZENX FBZEND FBZEDD FAZEDD FAZE	EQUIEQUIEQUIEQUIEQUIEQUIEQUIEQUIEQUIEQUI	0 1 2 3 4 12 15 17 19 21 23 28 30 34 35 36 47 50	FMS COMMAND ERROR STATUS ACTIVITY STATUS DRIVE NUMBER FILE NAME (8 BYTES) EXTENSION (3 BYTES) FILE ATTRIBUTES STARTING DISK ADDRESS ENDING DISK ADDRESS FILE SIZE FILE SECTOR MAP INDICAT OR FCB LIST POINTER CURRENT POSITION DATA INDEX RAMDOM INDEX RAME WORK BUFFER CURRENT DIRECTORY ADDRE SS FIRST DELETED DIRECTORY POINTER
100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125	0001 0002 0003 0004 0005 0011 0013 0015 0017 001C 001E 0022 0023 0024 002F 0032 0038 0040	* FBZFNC FBZESB FBZACT FBZESB FBZACT FBZDAW FBZENAM FBZEDA FBZSDA FBZSIZ FBZSMI  FBZFLP FBZCUR FBZINX FBZNX FBZNX FBZNX FBZNX FBZNW FBZNX FBZNW FBZND FBZTDAW FFTAN	EQUUEQUUEQUUEQUUEQUUEQUUEQUUEQUUEQUUEQU	0 1 2 3 4 1 15 17 19 21 23 28 30 34 35 36 47 50 59 64 NS	FMS COMMAND ERROR STATUS ACTIVITY STATUS DRIVE NUMBER FILE NAME (8 BYTES) EXTENSION (3 BYTES) FILE ATTRIBUTES STARTING DISK ADDRESS ENDING DISK ADDRESS FILE SIZE FILE SECTOR MAP INDICAT OR FCB LIST POINTER CURRENT POSITION DATA INDEX RAMDOM INDEX RAME WORK BUFFER CURRENT DIRECTORY ADDRE SS FIRST DELETED DIRECTORY POINTER
100 101 102 103 104 105 106 107 108 109 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125	0001 0002 0003 0004 0006 0001 0013 0015 0017 0016 0022 0023 0024 0025 0038 0040	* FBZFNC FBZESB FBZACT FBZESC FBZDRV FBZNAM FBZEXT FBZSDA FBZEDA FBZSIZ FBZSMI  FBZFLP FBZCUR FBZINX FBZRDX FBZRDX FBZRDX FBZRDX FBZRDX FBZRNX FBZRNX FBZRNX FBZRNX FBZRNX FBZROX	EQUUEQUUEQUUEQUUEQUUEQUUEQUUEQUUEQUUEQU	0 1 2 3 4 12 15 17 17 21 23 28 30 34 35 36 47 50 59 64 NS	FMS COMMAND ERROR STATUS ACTIVITY STATUS DRIVE NUMBER FILE NAME (8 BYTES) EXTENSION (3 BYTES) FILE ATTRIBUTES STARTING DISK ADDRESS ENDING DISK ADDRESS FILE SIZE FILE SECTOR MAP INDICAT OR FCB LIST POINTER CURRENT POSITION DATA INDEX RAMDOM INDEX RAME WORK BUFFER CURRENT DIRECTORY ADDRE SS FIRST DELETED DIRECTORY POINTER
100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116	0001 0002 0003 0004 0005 0011 0013 0015 0017 0016 0022 0023 0024 0027 0032 0038 0040	# FBZFNC FBZESB FBZACT FBZESB FBZACT FBZDAV FBZESAT FBZSDA FBZEDA FBZSIZ FBZSMI FBZFNX FBZENX FBZENT FEXT. BZEN FEXT. BZEN FEXT. SYS FEXT. SCR	EQUUEQUUEQUUEQUUEQUUEQUUEQUUEQUUEQUUEQU	0 1 2 3 4 1 15 17 17 19 21 23 28 30 47 50 59 64 NS	FMS COMMAND ERROR STATUS ACTIVITY STATUS DRIVE NUMBER FILE NAME (8 BYTES) EXTENSION (3 BYTES) FILE ATTRIBUTES STARTING DISK ADDRESS ENDING DISK ADDRESS FILE SIZE FILE SECTOR MAP INDICAT OR FCB LIST POINTER CURRENT POSITION DATA INDEX RAMDOM INDEX RAME WORK BUFFER CURRENT DIRECTORY ADDRE SS FIRST DELETED DIRECTORY POINTER
100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128	0001 0002 0003 0004 0006 0001 0013 0015 0017 0016 0022 0023 0024 0025 0032 0038 0040	* FBZFNC FBZESB FBZACT FBZESB FBZACT FBZDAW FBZENAM FBZEDA FBZEDA FBZSIZ FBZSMI  FBZFLP FBZCUR FBZINX FBZNWB FBZCDA FBZENDX FBZNWB FBZCDA  FBZFLP FBZENX FBZNWB FBZCDA  FBZFDP FBZENT FBZNBA FBZENT SENT SENT SENT SENT FEXT SEN FEXT SENT FEXT SENT FEXT SENT FEXT SENT FEXT FEXT FEXT FEXT FEXT FEXT FEXT FEX	EQUUEQUUEQUUEQUUEQUUEQUUEQUUEQUUEQUUEQU	0 1 2 3 4 1 15 17 19 21 23 28 30 34 35 36 47 50 59 64 NS	FMS COMMAND ERROR STATUS ACTIVITY STATUS DRIVE NUMBER FILE NAME (8 BYTES) EXTENSION (3 BYTES) FILE ATTRIBUTES STARTING DISK ADDRESS ENDING DISK ADDRESS FILE SIZE FILE SECTOR MAP INDICAT OR FCB LIST POINTER CURRENT POSITION DATA INDEX RAMDOM INDEX RAME WORK BUFFER CURRENT DIRECTORY ADDRE SS FIRST DELETED DIRECTORY POINTER
100 101 102 103 104 105 106 107 108 109 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128	0001 0002 0003 0004 0006 0001 0013 0015 0017 0016 0022 0023 0024 0025 0038 0040	# FBZFNC FBZESB FBZACT FBZESB FBZACT FBZDAV FBZNAM FBZEXT FBZSDA FBZEDA FBZSIZ FBZSMI FBZFDP FBZCUR FBZEDA FEZT.BA FEXT.BA FEXT.SYS FEXT.BAK FEXT.SCA FEXT.BAC	EQUUEQUUEQUUEQUUEQUUEQUUEQUUEQUUEQUUEQU	0 1 2 3 4 1 15 17 17 19 21 23 28 30 34 35 36 47 50 59 64 NS	FMS COMMAND ERROR STATUS ACTIVITY STATUS DRIVE NUMBER FILE NAME (8 BYTES) EXTENSION (3 BYTES) FILE ATTRIBUTES STARTING DISK ADDRESS ENDING DISK ADDRESS FILE SIZE FILE SECTOR MAP INDICAT OR FCB LIST POINTER CURRENT POSITION DATA INDEX RAMDOM INDEX RAME WORK BUFFER CURRENT DIRECTORY ADDRE SS FIRST DELETED DIRECTORY POINTER
100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130	0001 0002 0003 0004 0005 0011 0013 0015 0017 0016 0022 0023 0024 0024 0025 0038 0040	* FBZFNC FBZESB FBZACT FBZESB FBZACT FBZDAW FBZENAM FBZEDA FBZSDA FBZEDA FBZSIZ FBZSMI  FBZFNC FBZSNI  FBZFLP FBZCUR FBZINX FBZNX FBZT. SY FEXT. SY FEXT. SY FEXT. SA FEXT. SY FEXT. BAS FEXT. SC FEXT. DAT FEXT. BAC FEXT. DAT FEXT. BAC FEXT. DAT FEXT. BAC FEXT. DAT	EQUUEQUUEQUUEQUUEQUUEQUUEQUUEQUUEQUUEQU	0 1 2 3 4 12 15 17 17 19 21 23 28 30 34 35 36 47 50 59 64 NS	FMS COMMAND ERROR STATUS ACTIVITY STATUS DRIVE NUMBER FILE NAME (8 BYTES) EXTENSION (3 BYTES) FILE ATTRIBUTES STARTING DISK ADDRESS ENDING DISK ADDRESS FILE SIZE FILE SECTOR MAP INDICAT OR FCB LIST POINTER CURRENT POSITION DATA INDEX RAMDOM INDEX RAME WORK BUFFER CURRENT DIRECTORY ADDRE SS FIRST DELETED DIRECTORY POINTER
100 101 102 103 104 105 106 107 108 109 111 112 113 114 115 116 117 118 119 120 121 123 124 125 126 127 128 129 130 131	0001 0002 0003 0004 0006 0001 0013 0015 0017 0016 0022 0023 0024 0025 0032 0038 0040	* FBZFNC FBZESB FBZACT FBZESB FBZACT FBZDAV FBZENAM FBZEST FBZSDA FBZEDA FBZSIZ FBZSMI FBZFLP FBZCUR FBZENX FBZENT FEXT FEXT FEXT FEXT FEXT FEXT FEXT FEX	EQUUEQUUEQUUEQUUEQUUEQUUEQUUEQUUEQUUEQU	0 1 2 3 4 12 15 17 17 21 23 28 30 34 35 36 47 50 59 64 NS 0 1 2 3 4 5 6 7 8 8 9 9 9 9 1 9	FMS COMMAND ERROR STATUS ACTIVITY STATUS DRIVE NUMBER FILE NAME (8 BYTES) EXTENSION (3 BYTES) FILE ATTRIBUTES STARTING DISK ADDRESS ENDING DISK ADDRESS FILE SIZE FILE SECTOR MAP INDICAT OR FCB LIST POINTER CURRENT POSITION DATA INDEX RAMDOM INDEX RAME WORK BUFFER CURRENT DIRECTORY ADDRE SS FIRST DELETED DIRECTORY POINTER
100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131	0001 0002 0003 0004 0005 0011 0013 0015 0017 0016 0022 0023 0024 0024 0025 0038 0040	* FBZFNC FBZESB FBZACT FBZESB FBZACT FBZDAW FBZENAM FBZEDA FBZSDA FBZEDA FBZSIZ FBZSMI  FBZFNC FBZSNI  FBZFLP FBZCUR FBZINX FBZNX FBZT. SY FEXT. SY FEXT. SY FEXT. SA FEXT. SY FEXT. BAS FEXT. SC FEXT. DAT FEXT. BAC FEXT. DAT FEXT. BAC FEXT. DAT FEXT. BAC FEXT. DAT	EQUUEQUUEQUUEQUUEQUUEQUUEQUUEQUUEQUUEQU	0 1 2 3 4 12 15 17 17 19 21 23 28 30 34 35 36 47 50 59 64 NS	FMS COMMAND ERROR STATUS ACTIVITY STATUS DRIVE NUMBER FILE NAME (8 BYTES) EXTENSION (3 BYTES) FILE ATTRIBUTES STARTING DISK ADDRESS ENDING DISK ADDRESS FILE SIZE FILE SECTOR MAP INDICAT OR FCB LIST POINTER CURRENT POSITION DATA INDEX RAMDOM INDEX RAME WORK BUFFER CURRENT DIRECTORY ADDRE SS FIRST DELETED DIRECTORY POINTER
100 101 102 103 104 105 106 107 108 109 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 131 132 133	0001 0002 0003 0004 0006 0001 0013 0015 0017 0016 0022 0023 0024 0025 0032 0038 0040	* FBZFNC FBZESB FBZACT FBZESB FBZACT FBZDAV FBZENAM FBZEST FBZSDA FBZEDA FBZSIZ FBZSMI FBZFLP FBZCUR FBZENX FBZENT FEXT FEXT FEXT FEXT FEXT FEXT FEXT FEX	EQUUEQUUEQUUEQUUEQUUEQUUEQUUEQUUEQUUEQU	0 1 2 3 4 12 15 17 17 21 23 28 30 34 35 36 47 50 59 64 NS 0 1 2 3 4 5 6 7 8 8 9 9 9 9 1 9	FMS COMMAND ERROR STATUS ACTIVITY STATUS DRIVE NUMBER FILE NAME (8 BYTES) EXTENSION (3 BYTES) FILE ATTRIBUTES STARTING DISK ADDRESS ENDING DISK ADDRESS FILE SIZE FILE SECTOR MAP INDICAT OR FCB LIST POINTER CURRENT POSITION DATA INDEX RAMDOM INDEX RAME WORK BUFFER CURRENT DIRECTORY ADDRE SS FIRST DELETED DIRECTORY POINTER
100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131	0001 0002 0003 0004 0006 0001 0013 0015 0017 0016 0022 0023 0024 0025 0032 0038 0040	* FBZFNC FBZESB FBZACT FBZESB FBZACT FBZDAV FBZENAM FBZEST FBZSDA FBZEDA FBZSIZ FBZSMI FBZFLP FBZCUR FBZENX FBZENT FEXT FEXT FEXT FEXT FEXT FEXT FEXT FEX	EQUUEQUUEQUUEQUUEQUUEQUUEQUUEQUUEQUUEQU	0 1 2 3 4 12 15 17 17 21 23 28 30 34 35 36 47 50 59 64 NS 0 1 2 3 4 5 6 7 8 8 9 9 9 9 1 9	FMS COMMAND ERROR STATUS ACTIVITY STATUS DRIVE NUMBER FILE NAME (8 BYTES) EXTENSION (3 BYTES) FILE ATTRIBUTES STARTING DISK ADDRESS ENDING DISK ADDRESS FILE SIZE FILE SECTOR MAP INDICAT OR FCB LIST POINTER CURRENT POSITION DATA INDEX RAMDOM INDEX NAME WORK BUFFER CURRENT DIRECTORY ADDRE SS FIRST DELETED DIRECTORY POINTER

#### SUPERBRAIN



32K or 64K (Double or Quad Density units available). Uses two Z-80 CPU's. Commercial-type terminal with 12" monitor. Dual double density minifloppies. Over 350 kilobytes of storage (twice that with quad density drives). Two serial RS232 ports, I/O ports standard. Expandable with optional S-100 S-100 interface. Comes with CP/MTM 2.2 operating system. MiniMicroMart includes BASIC interpreter and can supply a wide range of CP/M Development and Application software.

	w/32K Double Density, List \$2995 . <b>\$2685</b>	
	w/64K Double Density, List \$3345 \$2883	
	w/64K Quad Density, List \$3995 \$3595	
,	64K Special Quad Version \$3395	

#### **INTERSYSTEMS**

formerly ITHACA AUDIO



#### **LIMITED TIME \$1299\***

The new Series II CPU Board features a 4 MHz Z-80A CPU and a full-feature front panel. 20slot actively terminated motherboard, with 25 amp power supply (50/60 Hz operation, incl. 68 cfm fan).

COMPLETE SYSTEM with InterSystem 64K RAM, I/O Board w/priority interrupt and double density disk controller board. Full 1-year warranty, List \$3595

ONLY \$2895\*

Above less disk controller, \$3195 . . . . \$2539\* \* Limited Time offer expires Sept. 15, 1980.

#### **HEWLETT-PACKARD HP-85A**

Desk-Top Computer



Call for Price!

F.O.B. shipping point. All prices subject to change and all offers subject to withdrawal without notice. Advertised prices are for prepaid orders. Credit card and C.O.D. 2% higher. C.O.D. may require deposit.

## **MiniMicroMart**

1618 James Street Syracuse, NY 13203 (315) 422-4467 same. I load BAS82 at address C800, where I have some free memory. The program must be loaded somewhere that BASIC doesn't know about so it isn't wiped out.

Next, I wrote a set of subroutines in BA-SIC that called the different functions in BAS82. These subroutines appear in lines 9000 through 9630 in Listings 4, 5 and 6. Lines 9000 through 9070 comprise the initialization subroutine. They call the system loader to load BAS82, set the BAS82 entry point in the location BASIC uses for the address of the USR function, call BAS82 with a parameter value of "IN" and turn off the cursor display.

Lines 9100 through 9140 draw a point. Note that X is the column coordinate with valid values from 0 to 183. Y is the row coordinate with valid values from 0 to 65.

The draw-line subroutine in lines 9200 through 9240 uses variables U and V as the column and row coordinates of one end of the line, and variables X and Y as the column and row coordinates of the other end. Again, BAS82 is called to transmit the appropriate control string to the CT-82.

The clear subroutine in lines 9300 through 9340 sends a clear screen command. The exit subroutine in lines 9400 through 9450 restores the CT-82 to nongraphics mode and turns on the cursor.

The erase line subroutine in lines 9500 through 9540 and the erase point subroutine in lines 9600 through 9630 work the same as their equivalent draw subroutines.

Using these subroutines, I wrote three BASIC programs. The first, Random Draw/ Erase Line (Listing 4), generates coordinates randomly, draws a line, generates another set of random coordinates, erases a line and then repeats this loop the specified number of times. Although this is much more interesting to watch when it is running than after it has stopped, Photo 4 shows how it appears.

Listing 5 shows a more practical program that draws a sine curve (see Photo 5). It essentially uses the equation Y = SIN(X). Lines 310 and 320 look strange but they handle the scaling for the screen dimensions; lower values of Y will cause the curve to move up on the screen. Also, line 420 positions the cursor and labels the graph.

The third program (Listing 6) generates a bar graph (see Photo 6). This graph shows the frequency distribution of the function x = RND(0) \* 20 for 600 trials. In other words, it shows how random the random number generator is by trying it 600 times and graphically displaying the result. The bargraphing technique is useful in displaying data for easy comparison.

This is currently where I am in exploring the capabilities of the CT-82. Using the basic concepts presented in this article, you will be able to discover even more.

				List	ing 3. BAS8	2.			
1 2		0000			* CT82-BAS	NAM IC GF	AF	BAS82 PHICS INTER	RFACE
3 137		0000			* SSC 8-16	-79 V	11.	PNT,XRF	
138 139		E101			* OUTEEE	EQU		X'E1D1'	USED FOR FUNNY CHARACTE
140		0026			PASS	EQU		X'26'	ADDRESS PASSED BY BASIC
141 142 143 144	4R 10	0000 0000 0002			* BAS.82	ENT LDX LDX		PASS O,X	DESCRIPTOR ADDRESS STRING ADDRESS (PACKET)
145 146	16 21	0007	E6			STX			SAVE GET
147 148 149	26	0009 000B			*	LDA		1,X #C'I'	FUNCTION INITIALIZE?
150 151	32 2R	000b 000f	26 81	07 (0016) 4E		BNE CMP		\$5 #C'N' \$5	
152 153 154	6 3 R	0013 0016	7E	03 (0016) 00B7	\$5	JMP NUL		INIT	YES - INITIALIZE CT82
155	2 R		26	43 07 (0021)		BNE		#C'C' \$8	CLEAR?
157 158 159	2 R 6 3 R		26	03 (0021) 00B1		BNE JMP	А	#C'S' \$8 CLEAR	CS - CLEAR SCREEN ?
160	2R 6	0021	C1	44 03 (0028)	\$8		В	#C'D' \$10	DRAW?
162	3 R 2 R		7E	0053	\$10	JMP	B	DRAW #C'E'	ERASE?
164	6 3 R	002A	26	03 (002F) 0082	110	BNE	Ü	\$12 ERASE	NO NO
166	2 R	002F	C1	58 03 (0036)	\$12		В	#C'X' INPERR	EXIT?
168	3 R 3 R	0033	7E	0040 00ED	INPERR	JMP		EXIT #IEMSG	
170 171	21 *	0039 0030	BD	OOBD AD1B		JSR JSR		SEND INBUFF	ERROR MESSAGE WAIT FOR CR
172 173	26 3R		CE	0113	EXIT	RTS LDX		#RESMSG.1	RESET CT-82
174 175	15		CE	OOBD FFFF		J S R L D X		SEND #X'FFFF'	WAIT A WHILE
176	4 R 8		26	FD (0049)	\$5	BNE		\$5	
178	3R 12 * 17		BD	00BD		JSR		SEND	RESTORE SCROLLING
180 181 182	17	0052	39		* DRAW	RTS		*	DRAW POINT OR LINE
183 184 185 186	2 R 6 2 R 6	0053 0055 0057	27 81	07 (005E)	DRAW	CMP BEQ		#C'P' DRAW.PT #C'L' DRAW.LN	DRAW POINT OR LINE
187 188	3 R		7E	0036	DRAW.PT	JMP JSR		INPERR INTWO	INPUT ERROR GET X AND Y
189 190	14	0061	FE	013A 011E	DRAW.FI	LDX		X.AND.Y	GET X AND Y SAVE IN STRING
191 192	23	0067	CE	011 C 00BD		LDX		#DP SEND	SEND IT
193 194		0060			* DRAW.LN	EQU		*	
195 196 197 198	9R* 14 20 25	006D B 0070 F 0073 F 0076 F 0079 F 007C C	F E F F	0138 0123		JSR LDX STX LDX		INFOUR U.AND.V DLU X.AND.Y	GET U, V, X, AND Y
199 200 201	31 34 37		F F C E	0125		STX		DLX #DL	
202	31	0082	, E	3000	* ERASE	JMP EQU		SEND *	ERASE LINE OR POINT
204	2 R 6	R 0082 0084	27	07 (008b)			Α	#C'P' ERS.PT	POINT?
206 207	2 R 6	0086 0088	81 27	4C 12 (009C)			Α	#C'L' ERS.LN	LINE? YES
208	3 R 9 R *	0800	BD	0036 0008	ERS.PT	JMP JSR		INPERR INTWO	ERROR GET X AND Y
210 211	14	0093	FF			LDX		X.AND.Y EPX	
212	23	0099	7E	0128 00BD		L D X		#EP SEND	
214	14	009F	FE	00 CB 01 38	ERS.LN	J S R L D X		U.AND.V	GET U, V, X, AND Y
216 217 218	20 25 31	00A2 00A5 00A8	FE	013A		LDX		X.AND.Y	
219	34	00AB 00AE	CE	0120		LDX		#EL	
221		00B1			* CLEAR	JMP		SEND *	ERASE SCREEN
223 224 225	3 R 6	00B1 00B4			*	LDX		#CLRMSG SEND	
226	3R	00B7 00B7	CF	0066	INIT	EQU		*	INITIALIZE CT-82
228	6	00BA	7E	00BD	*	J M P		#SMSG SEND	
230		00BD			SEND	EQU		*	SEND STRING AND LOOP TO NEXT COMMAND
231	5 R 9	00BD 00BF	08			LDA			GET CHARACTER
233 234 235	11 15 20	00 C 0 00 C 2 00 C 4	26	01 (00C5)				#X'FF' \$10	SPECIAL TERMINATOR?

## PROFESSIONAL B/W MONITORS

Designed for industry...priced for the home.



#### video 100

The video 100 computer monitors are ideal for all your personal and business needs. These highly reliable 12" black and white monitors feature a 12 MHz band width and 80 character by 24 line display. Plug-in compatability with Apple, Atari, Radio Shack, O.S.I., Micro-Term and Exidy make these the perfect text display for almost any system.

Sturdy, lightweight plastic cabinet

**UNDER \$170.00** 

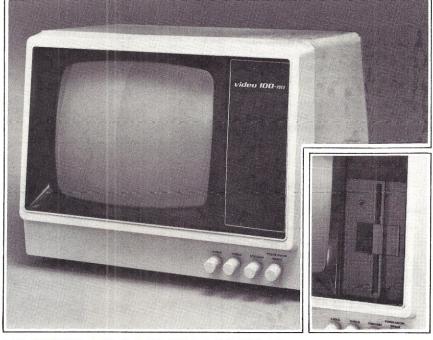
#### video 100-ao

The model 80 features an industrial grade metal cabinet with builtin disk mounting capability and space for an 11" x 14" PC board for custom designed electronics.

The solid state circuitry assures a sharp, stable, and trouble-free picture. The front panel controls include power, contrast, horizontal hold, vertical hold, and brightness. Adjustments for size, video level, and width are located on the rear panel.

Rugged metal cabinet with disk

**UNDER S200.00** 



#### **VIDEO 100 AND VIDEO 100-80 SPECIFICATIONS**

- 12" diagonal measure display
- Convenient front panel controls
- Video bandwidth 12MHz ±3 DB

- Input impedance 75 Ohms
- 80 character by 24 line display
- 90° deflection picture tube
- Video 100-80 provides mounting space for mini floppy disk.
- Resolution-Over 700 lines at center horizontally-over 350 lines at center vertically

#### EEDEX CORPORAT

2420 East Oakton • Suite E • Arlington Heights, III. 60005 (312) 364-1180 • TLX: 25-4786 Dealer discount available

space

#### **'68' MICRO** JOURNAL TM

★ The only ALL 68XX Computer Magazine.

Foreign Orders-Add:

Air Mail \$30.00 /Year Surface \$12.00 /Year

1-Year \$18.50 2 Years \$32.50 3 Years \$48.50

OK, PLEASE ENTER MY SUBSCRIPTION

Bill my: M/C □ — VISA □

Expiration Date\_ For 1-Yr. 2 Yrs. 3 Yrs.

Enclosed: \$\_ Name

Street

City.

State\_ '68' MICRO JOURNAL™ 3018 Hamill Road **HIXSON, TN 37343** 

#### **OHIO SCIENTIFIC**

**DUNGEONS** - A fantasy adventure for OSI. You can be a fighter, dwarf, halfling, elf, or magic-user in a search for gold in the unexplored dungeons beneath the Wizard's city or in the forest that surrounds the city. Evil monsters lurk in the forest and dungeons to guard the gold that was placed there long ago by the Wizard. Everything is graphically displayed for the C1, 2, 4, and

Price is \$12.95 for cassette and \$15.95 for 51/4" or 8" disk. Requires 8K. Send \$1 for complete hardware and software catalog, includes a free game listing.

#### Aurora Software Associates

353 South 100 East#6 193 Springville, Utah 84663



236 237 238 239	9R* 13 18		BD E1D1 20 F3 (OOBD) 39	\$10	JSR BRA RTS	OUTEEE	SEND IT
240		00СВ		INFOUR	EQU	*	GET 4 DECIMAL NUMBERS U
241	5 R	ООСВ	FE 0134		LDX	PKTADR	GET PACKET ADDRESS
242	10	OOCE	A6 04		LDA A	4,X	GET U
243	15	0000	B7 0138		STA A		
244	20	0003	A6 05		LDA A	5,X	GET V
245	25	0005	B7 0139		STA A	V	
246		8000		INTWO	EQU	*	GET 2 DECIMAL NUMBERS X
247	5 R	0008	FE 0134		LDX	PKTADR	GET PACKET ADDRESS
248	10	OODB	A6 02		LDA A	2,X	GET X
249	15	OODD	B7 013A		STA A	EX	
250	20	00E0	A6 03		LDA A	3,X	GET Y
251	25	00E2	B7 013B		STA A	Y	
252	30	00E5	39		RTS		
253				*			
254				*			
255			1016	SMSG	CON	DX'1016'	PUT IN GRAPHICS MODE
256			0000		CON	0,0	KILL SOME TIME
257			1E18		CON	DX'1E18'	DISABLE SCROLLING
258		ODEC	FF		CON	X'FF'	
259		OOED	0B0015	IEMSG	CON	X'OB',DX	'0015' CURSOR POS
260		00F0	494E56414C49		CON		D INPUT - '
261			52455455524E		CON		TO CONTINUE', X'FF'
262		0113	1011	RESMSG.1	CON	DX'1C11'	RESTORE FORMAT 1
263		0115	FF		CON	X'FF'	
264		0116	1E08	RESMSG.2	CON	DX'1E08'	ENABLE SCROLL
265		0118	FF		CON	X'FF'	
266		0119	1016	CLRMSG	CON	DX'1016'	CLEAR SCREEN
267		011B	FF		CON	X'FF'	
268				*			
269			1013	DP	CON	DX'1013'	DRAW PT. COMMAND
270			0000	DPX	CON	0,0	X,Y
271		0120	FF		CON	X'FF'	
272				*			
273			1003	DL	CON	DX'1003'	DRAW LINE COMMAND
274			0000	DLU	CON	0,0	U,V
275			0000	DLX	CON	0,0	X,Y
276		0127	FF	440	CON	X'FF'	
277				*			
278			1014	EP	CON	DX'1014'	ERASE PT. COMMAND
279			0000	EPX	CON	0,0	X , Y
280		0120	FF		CON	X'FF'	
281		0136	100/	*		DV1450/	EDACE LINE COMMAND
282			1004	EL	CON	DX'1004'	ERASE LINE COMMAND
283			0000	ELU	CON	0,0	u,v
284		0131	0000	ELX	CON	0,0 X'FF'	X,Y
286		0133	r.c		CON	v	
287		0134		PKTADR	RMB	2	PACKET ADDRESS SAVE
288		0136		TEMP	RMB	2	
289		0138		U.AND.V	EQU	*	
290		0138		U	RMB	1	
291		0139		v	RMB	1	
292		013A		X.AND.Y	EQU	*	
293		013A		EX	RMB	1	
201		013B		Y	RMB	1	
294				*			
294							
		0130		LAST	ENT		

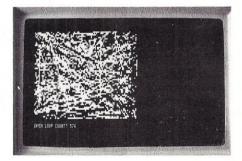


Photo 4. Sample output of random draw/erase line program.

#### Listing 4. Random draw/erase line program.

```
10 REM RANDOM DRAW/ERASE LINE
100 GOSUB 9000
200 GOSUB 9300
220 GOTO 1000
250 FOR I=1 TO L
300 U=RND(0)*100
310 V=RND(0)*60
320 X=RND(0)*100
330 Y=RND(0)*60
400 GOSUB 9200 : REM DRAW A LINE
500 U=RND(0)*100
510 V=RND(0)*60
529 X=RND(0)*100
530 Y=RND(0)*60
```

ZIP 

STATE

```
550 GOSUB 9500 : REM ERASE A LINE
900 NEXT I
1000 PRINT CHR$(11); CHR$(0); CHR$(21);
1010 PRINT CHR$(6):REM ERASE TO
1020 INPUT "ENTER LOOP COUNT";L
1040 IF L>0 THEN 250
 1060 GOSUB 9400
1100 END
9000 REM INITIALIZE CT-82 GOSUB

9010 EXEC, "GET 1.BAS82.BIN"

9020 POKE HEX("24"), HEX("C8"): POKE HEX("25"), HEX("00")

9030 ZZS="IN"
9040 Z=USR(PTR(ZZ$))
9050 PRINT CHR$(30); CHR$(21): REM TURN OFF CURSOR
9070 REM ***
9100 REM DRAW POINT (X,Y) GOSUB
9110 ZZS="DP"+CHR$(X)+CHR$(Y)
9120 Z=USR(PTR(ZZ$))
9130 RETURN
9140 REM ***
9200 REM DRAW LINE (U,V,X,Y) GOSUB
9210 ZZS="DL"+CHR$(U)+CHR$(V)+CHR$(X)+CHR$(Y)
9220 Z=USR(PTR(ZZ$))
9230 RETURN
9240 REM **
9300 REM CLEAR GOSUB
9310 ZZ$="CS"
9320 Z=USR(PTR(ZZ$))
9330 RETURN
9340 REM ***
9400 REM EXIT GOSUB
9410 ZZ$="X"
9420 Z=USR(PTR(ZZ$))
9430 PRINT CHR$(30); CHR$(5)
9440 RETURN
9450 REM ***
9500 REM ERASE LINE (U,V,X,Y) GOSUB
9510 ZZS="EL"+CHR$(U)+CHR$(V)+CHR$(X)+CHR$(Y)
9520 Z=USR(PTR(ZZ$))
9530 RETURN
9540 RETURN

9640 REM ***

9600 REM ERASE POINT (X,Y) GOSUB

9610 ZZ$="EP"+CHR$(X)+CHR$(Y)

9620 Z=USR(PTR(ZZ$))
```

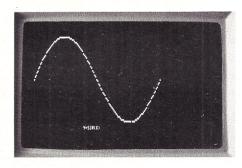


Photo 5. Sample output from sine curve program.

#### Listing 5. Draw sine curve program.

```
10 REM DRAW SINE CURVE
100 GOSUB 9000
300 FOR I=0 TO 2*PI STEP .05
310 X=20*I
320 Y=30*(1-SIN(I))+1
350 GOSUB 9100

400 NEXT I

420 PRINT CHR$(11); CHR$(25); CHR$(21); "Y=SIN(X)";

500 INPUT #0,A$

600 GOSUB 9400
700 END
9000 REM INITIALIZE CT-82 GOSUB
9010 EXEC, "GET 1.BAS82.BIN"
9020 POKE HEX("24"), HEX("C8"): POKE HEX("25"), HEX("00")
9030 ZZ$="IN"
9040 Z=USR(PTR(ZZ$))
9050 PRINT CHR$(30); CHR$(21): REM TURN OFF CURSOR
9050 RETURN

9070 REM ***

9100 REM DRAW POINT (X,Y) GOSUB

9110 ZZS="DP"+CHR$(X)+CHR$(Y)
9120 Z=USR(PTR(ZZ$))
9130 RETURN
9140 REM ***
9200 REM DRAW LINE (U,V,X,Y) GOSUB
9210 ZZ$="DL"+CHR$(U)+CHR$(V)+CHR$(X)+CHR$(Y)
9220 Z=USR(PTR(ZZ$))
9230 RETURN
9240 REM **
9300 REM CLEAR GOSUB
9310 ZZ$="CS"
9320 Z=USR(PTR(ZZ$))
```

#### Now-Break Through The 64K Micro-Memory Limit!

Bank Selectable 16K Static RAM



#### SAVE \$50.00 LIMITED TIME OFFER

Don't buy any more antique RAMs (RAM without bank select) - now there's Netronic's new SWEET SIXTEEN board featuring a universal software bank select system. SWEET SIXTEEN is capable of addressing 2,048 different banks. With SWEET SIXTEEN boards you can add memory beyond the 64K limit, or expand to a multiterminal system.

#### LOOK AT THESE FEATURES:

- 300 NS, low power 2114's.
- Software Bank Selector Universal decoder works with Cromenco, Alpha Micro, Netronics, most other systems, or your design. Onboard dip switches: Bank Select Enable; Reset Enable; Reset Disable; Port Address; Port Data.
- All Inputs And Outputs meet the proposed IEEE standards for the S-100 bus.
- 4.0 MHz Operation.
- Schmitt Trigger Buffer on all signals for maximum noise immunity.
- Addressable On 16k Boundaries, 0-64k, dip switch selectable.
- Phantom Option, dip switch selectable.
- PWR/MWRITE Option, dip switch selectable.
- LED Indicator to display status.
- Glass Epoxy PC Board with gold-plated contacts and double-sided solder mask
- Fully Socketed.
- Four Separate Regulators for maximum stability.

10-Day Money-Back Policy For Wired & Tested Unit: Try a fully wired board — then either keep it, return it for kit, or simply return it in working condi-

Continental U.S.A. Credit Card Buyers Outside Connecticut:

#### CALL TOLL FREE: 800-243-7428

From Connecticut Or For Assistance: (203) 354-9375

Please send the items checked below:

SWEET SIXTEEN kit; No. S-16 . . . (reg. price \$249.95) now \$199.95\*

SWEET SIXTEEN, fully assembled, tested, burned in; No. S-16W . . . (reg. price \$289.95) now \$239.95\*

\*Plus \$2 postage & insurance. Connecticut residents add sales tax.

Total Enclosed: S -

☐ Personal Check ☐ Money Order/Cashier's Check ☐ VISA ☐ Master Charge (Bank No.) Exp. Date. Acct. No. .

Signature Print

Name

State.

RESEARCH & DEVELOPMENT, LTD. 333 Litchfield Rd., New Milford, CT 06776

#### If you're serious about the stock market, you need Tickertec<sup>™</sup>



#### Watch 48 to 400 of your favorite stocks without a 15 minute delay.

Tickertec™ is a computer program that displays the NYSE or AMEX tickertape on your TRS-80™ Model I or both exchanges as an option on the Model II. You see every trade as it is reported by the exchange and track the last ten trades, tickertape reported volume, and high and low limits on the stocks you are watching. Tickertec program prices start at \$1,000.00 with many optional features available including hard copy and portfolio management systems. Programs may be purchased for cash (i.e., hard dollars) or payment can be arranged in the form of discounted brokerage commissions (i.e., Soft Dollar Software™). Exchange fees are extra. Call for FREE brochure TOLL-FREE at (800) 223-6642; in New York call (212) 687-0705; or circle the reader service number.

#### MaxUle& ~171 Company Inc.

6 East 43rd Street, N.Y., N.Y. 10017

#### R MECHANISM



Made by Binder Magnete for U.S. assembled 180 CPS bidirectional matrix printer, 0-132 and 0-158 columns. Includes single platen, ribbon drive, paper guides, motors, belts, etc. In 26"Wx8½"Hx20"D beige case with cast aluminum bottom. Add your own control/interface electronics and print heads and make it operational. 75 lbs. sh. #MPM/M12 . . . . . . \$125.

PRINT STAND for above, chocolate brown steel with 24"x13" top support. Space behind foot panel for storage. 0/A 24"Wx25½"Hx21"D; 38 lbs. Shipped via truck or bus. #PSD/M12

#### DATANETICS KEYBOARD

75 keys, ASCII encoded. +5 and -12 VDC required. Keyboard assembled with unassembled case, PCB cable, pinouts. 20x73/4x23/4, 10 lbs. sh. #0284-819-10



CONTROLLER CPU, directed mechanical functions of above mechanism. Has P8085 MPU with 5.7143 Mhz crystal, 2/8255A, 8253, rystal, 2/8255A, 8253, 8212, 4/8205, 9/3341 FIFO, 4/2111-1 RAM, 7400, 3/74LS00, 74LS125,

74LS161. Sockets for 6/2708's. Requires +12, -12, +5, & -5 VDC. #217-244 Send for our FREE New SURPLUS CATALOG Today!

Address Dept. K . VISA, MASTERCARD Accepted. Prices F.O.B. Lima, O. . Orders over 50 lbs. fgt. coll. Electronic Surplus Since 1947 Phone 419/227-6573

FAIR RADIO SALES 1016 E. EUREKA · Box 1105 · LIMA, OHIO · 45802

```
9330 RETURN
9340 REM ***
9400 REM EXIT GOSUB
9410 ZZ$="X"
9420 Z=USR(PTR(ZZ$))
9430 PRINT CHR$(30); CHR$(5)
9440 RETURN
9450 REM ***
9500 REM ERASE LINE (U,V,X,Y) GOSUB
9510 ZZ$="EL"+CHR$(U)+CHR$(Y)+CHR$(X)+CHR$(Y)
9520 Z=USR(PTR(ZZ$))
9530 RETURN
9540 REM ***
9600 REM ERASE POINT (X,Y) GOSUB
9610 ZZ$="EP"+CHR$(X)+CHR$(Y)
       Z=USR(PTR(ZZ$))
9630 RETURN
```

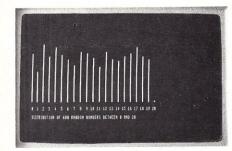


Photo 6. Output sample from bar graph program.

```
10 REM BAR GRAPH OF RANDOM NUMBER DISTRIBUTION 90 DIM V(20)
100 GOSUB 9000
200 FOR I=1 TO (
210 X=RND(0)*20
220 \text{ V(X)} = \text{V(X)} + 1
230 NEXT I
300 V=50
310 FOR I=0 TO 20
320 X=6*I
330 Y=50-V(I)
340 U=X
350 GOSUB 9200
360 NEXT
420 PRINT
430 PRINT "DISTRIBUTION OF 600 RANDOM NUMBERS BETWEEN 0 AND 20"
500 INPUT #0, A$
600 GOSUB 9400
610 END
9010 EXEC, "GET 1.BAS82.BIN"
9020 POKE HEX("24"), HEX("C8"): POKE HEX("25"), HEX("00")
9030 ZZS="IN"
9040 Z=USR(PTR(ZZ$))
9050 PRINT CHR$(30); CHR$(21): REM TURN OFF CURSOR 9060 RETURN
9070 REM ***
9100 REM DRAW POINT (X,Y) GOSUB
9110 ZZ$="DP"+CHR$(X)+CHR$(Y)
9120 Z=USR(PTR(ZZ$))
9130 RETURN
9140 REM ***
9200 REM DRAW LINE (U,V,X,Y) GOSUB
9210 ZZS="DL"+CHR$(U)+CHR$(V)+CHR$(X)+CHR$(Y)
9220 Z=USR(PTR(ZZ$))
9230 RETURN
9240 REM **
9300 REM CLEAR GOSUB
9310 ZZ$="CS
9320 Z=USR(PTR(ZZ$))
9330 RETURN
9340 REM ***
9400 REM EXIT GOSUB
9410 ZZ$="X"
9420 Z=USR(PTR(ZZ$))
9430 PRINT CHR$(30); CHR$(5)
9440 RETURN

9450 REM ***

9500 REM ERASE LINE (U,V,X,Y) GOSUB

9510 ZZS="EL"+CHR$(U)+CHR$(V)+CHR$(X)+CHR$(Y)
9520 Z=USR(PTR(ZZ$))
9530 RETURN
9540 REM ***
9600 REM ERASE POINT (X,Y) GOSUB
9610 ZZ$="EP"+CHR$(X)+CHR$(Y)
       Z=USR(PTR(ZZ$))
```

Listing 6. Bar graph of random number distribution program.

#### **NEW! TPM\* for TRS-80 Model II NEW! System/6 Package** Computer Design Labs

# **Z80**° Disk Software

We have acquired the rights to all TDL software (& hardware). TDL software has long had the reputation of being the best in the industry. Computer Design Labs will continue to maintain, evolve and add to this superior line of quality software.

Software with Manual/Manual Alone

All of the software below is available on any of the following media for operation with a Z80 CPU using the CP/M\* or similar type disk operating system (such as our own TPM\*).

for TRS-80\* CP/M (Model I or II) for 8" CP/M (soft sectored single density) for 5'4" CP/M (soft sectored single density) for 5'4" North Star CP/M (single density) for 5'4" North Star CP/M (double density)

#### BASIC I

A powerful and fast Z80 Basic interpreter with EDIT, RENUMBER, TRACE, PRINT USING, assembly language subroutine CALL, LOADGO for "chaining", COPY to move text, EXCHANGE, KILL, LINE INPUT, error intercept, sequential file handling in both ASCII and binary formats, and much, much more. It runs in a little over 12 K. An excellent choice for games since the precision was limited to 7 digits in order to make it one of the fastest around. \$49.95/\$15.

#### **BASIC II**

Basic I but with 12 digit precision to make its power available to the business world with only a slight sacrifice in speed. Still runs faster than most other Basics (even those with much less precision). \$99.95/\$15.

#### **BUSINESS BASIC**

The most powerful Basic for business applications. It adds to Basic II with random or sequential disk files in either fixed or variable record lengths, simultaneous access to multiple disk files, PRIVACY command to prohibit user access to source code, global editing, added math functions, and disk file maintenance capability without leaving Basic (list, rename, or delete). \$179.95/\$25.

#### ZEDIT

A character oriented text editor with 26 commands and "macro" capability for stringing multiple commands together. Included are a complete array of character move, add, delete, and display function. \$49.95./\$15.

#### ZTEL

Z80 Text Editing Language - Not just a text editor. Actually a language which allows you to edit text and also write, save, and recall programs which manipulate text, Commands include conditional branching, subroutine calls, iteration, block move, expression evaluation, and much more. Contains 36 value registers and 10 text registers. Be creative! Manipulate text with commands you write using Ztel. \$79.95/\$25.

A Z80 Text Output Processor which will do text formatting for manuals, documents, and other word processing jobs. Works with any text editor. Does justification, page numbering and headings, spacing, centering, and much more! \$79.95/\$25.

#### MACRO I

A macro assembler which will generate relocateable or absolute code for the 8080 or Z80 using standard Intel mnemonics plus TDL/Z80 extensions. Functions include 14 conditionals, 16 listing controls, 54 pseudoops, 11 arithmetic/logical operations, local and global symbols, chaining files, linking capability with optional linker, and recursive/reiterative macros. This assembler is so powerful you'll think it is doing all the work for you. It actually makes assembly language programming much less of an effort and more creative. \$79.95/\$20.

#### MACRO II

Expands upon Macro I's linking capability (which is useful but somewhat limited) thereby being able to take full advantage of the optional Linker. Also a time and date function has been added and the listing capability improved. \$99.95/\$25.

#### LINKER

How many times have you written the same subrouline in each new program? Top notch professional programmers compile a library of these subroutines and use a Linker to tie them together at assembly time. Development time is thus drastically reduced and becomes comparable to writing in a high level language but with all the speed of assembly language. So, get the new CDL Linker and start writing programs in a fraction of the time it took before. Linker is compatible with Macro I & II as well as TDL/Xitan assemblers version 2.0 or later. \$79.95/\$20.

#### **DEBUGI**

Many programmers give up on writing in assembly language even though they know their programs would be faster and more powerful. To them assembly language seems difficult to understand and follow, as well as being a nightmare to debug. Well, not with proper tools like Debug I. With Debug I you can easily follow the flow of any Z80 or 8080 program. Trace the program one step at a time or 10 steps or whatever you like. At each step you will be able to see the instruction executed and what it did. If desired, modifications can then be made before continuing. It's all under your control. You can even skip displaying a subroutine call and up to seven breakpoints can be set during execution. Use of Debug I can pay for itself many times over by saving you valuable debugging time. \$79.95/\$20.

#### **DEBUGII**

This is an expanded debugger which has all of the features of Debug I plus many more. You can "trap" (i.e. trace a program until a set of register, flag, and/or memory conditions occur). Also, instructions may be entered and executed immediately. This makes it easy to learn new instructions by examining registers/memory before and after. And a RADIX function allows changing between ASCII, binary, decimal, hex, octal, signed decimal, or split octal. All these features and more add up to give you a very powerful development tool. Both Debug I and II must run on a Z80 but will debug both Z80 and 8080 code. \$99.95/\$20.

#### ZAPPLE

A Z80 executive and debug monitor. Capable of search, ASCII put and display, read and write to I/O ports, hex math, breakpoint, execute, move, fill, display, read and write in Intel or binary format tape, and more!

#### APPLE

8080 version of Zapple

#### NEW! TPM now available for TRS-80 Model

A NEW Z80 disk operation system! This is not CP/M\*. It's better! You can still run any program which runs with CP/M\* but unlike CP/M\* this operating system was written specifically for the Z80\* and takes full advantage of its extra powerful instruction set. In other words its not warmed over 8080 code! Available for TRS-80\* (Model I or II). Tarbell, Xitan DDDC, SD Sales "VERSA-FLOPPY", North Star (SD&DD), and Digital (Micro) Systems, \$79.95/\$25

#### SYSTEM MONITOR BOARD (SMB II)

A complete I/O board for S-100 systems. 2 serial ports, 2 parallel ports, 1200/2400 baud cassette tape interface, sockets for 2K of RAM, 3-2708/2716 EPROM's or ROM, jump on reset circuitry. Bare board \$49.95/\$20.

#### ROM FOR SMB II

2KX8 masked ROM of Zapple monitor. Includes source listing \$34.95/\$15.

#### PAYROLL (source code only)

The Osborne package. Requires C Basic 2 5" disks \$124.95 (manual not included) 8" disks \$ 99.95 (manual not included) Manual \$20.00

#### ACCOUNTS PAYABLE/RECEIVABLE (source code only)

By Osborne, Requires C Basic 2 5" disks \$124.95 (manual not included) 8" \$99.95 (manual not included) Manual \$20.00

#### GENERAL LEDGER (source code only)

By Osborne. Requires C Basic 2 disks \$99.95 (manual not included) disks \$99.95 (manual not included) Manual \$20.00

#### C BASIC 2

Required for Osborne software. \$99.95/\$20.



342 Columbus Avenue Trenton, N.J. 08629

#### - Carl Galletti and Roger Amidon, owners. SYSTEM/6

TPM with utilities, Basic I interpreter, Basic E compiler, Macro I assembler, Debug I debugger, and ZEDIT text

Above purchased separately costs \$339.75

Special introductory offer. Only \$179.75 with coupon!!



#### ORDERING INFORMATION

Visa, Master Charge and C.O.D. O.K. To order call or write with the following information.

VISA

- Name of Product (e.g. Macro I)
- Media (e.g. 8" CP/M)
  Price and method of payment (e.g. C.O.D.) include credit card info. if applicable.
- Name, Address and Phone number,
- For TPM orders only: Indicate if for TRS 80, Tarbell, Xitan DDDC, SD Sales (51/4" or 8"). ICOM (51/4" or 8"), North Star (single or double density) or Digital (Micro) Systems.
- N.J. residents add 5% sales tax.

Manual cost applicable against price of subsequent software purchase in any item except for the Osborne

#### For information and tech queries call 609-599-2146

For phone orders ONLY call toll free 1-800-327-9191 Ext. 676

(Except Florida)

#### **OEMS**

Many CDL products are available for licensing to OEMs. Write to Carl Galletti with your requirements.

- Z80 is a trademark of Zilog
- \* TRS-80 is a trademark for Radio Shack
  \* TPM is a trademark of Computer Design Labs. It is not
- \* CP/M is a trademark of Digital Research

Prices and specifications subject to change without

DEALER INQUIRIES INVITED.

# Tracking Down The Bus

Answers the question of why some boards won't work with your S-100 system.

Richard A. Rodman c/o Envo, Inc. 800 Follin Lane Vienna, VA 22180

The S-100 bus has one intrinsic characteristic: it's based on the timing signals of the 8080 microprocessor. Thus, to adapt bus, the signals generated by the 8080 have to be simulated by the Z-80 CPU circuit de-

sian.

This is not easy. The Z-80 requires only a single clock and generates much more elegant control signals, while the 8080 requires a two-phase clock with 12-volt swings.

Engineers have found that the simplest way to simulate the two-phase clock on the bus is to use the 8224 clock generator chip. While the engineers at Cromemco did not follow this route, Ithaca Intersystems did;

theirs is the most popular Z-80 CPU board in use.

Many boards, however, do not work with this CPU, even in its latest version. The problem is related to the S-100 interface logic, and the phase of clock 2 and clock 1 to the PSYNC signal. The 8080 CPU generates PSYNC on the leading edge of clock 2. Clock 2 makes one high-to-low transition during PSYNC, and clock 1 makes a low-to-high transition.

Peripheral boards use these relative characteristics in a number of ways.

Dynamic memory boards use the high-to-low transition of clock 2 during PSYNC to latch in the address, which is stable at the time. Examples of this type are the Processor Technology 16KRA and 32KRA memory boards.

Other boards, such as the Solid State Music VB1 and many static memory boards, use the low-to-high transition of clock 1 for the same purpose.

Finally, some boards will use

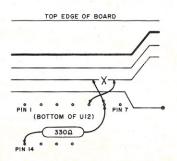


Fig. 3. Bottom of board modification.

the falling edge of clock 2 and the rising edge of PSYNC to toggle circuitry for the generation of wait states. These include the Screensplitter and Alpha Micro AM-200 floppy-disk controller.

Why will some of these boards work as is, others poorly and most not at all?

Fig. 1 shows the circuitry used by Ithaca Intersystems to generate PSYNC. The 02TTL output of the 8224 is used to operate the Z-80 clock, whereas the standard outputs 01 and 02, powered from a 5-volt supply, are buffered onto the bus. Note also that the Z-80 output/MREQ (not memory request) drives a 74121 monostable to generate the PSYNC pulse on its falling edge.

A timing diagram of these signals is given in Fig. 2. Since the Z-80 outputs /MREQ low on the falling edge of the clock applied to it, that PSYNC will make its low-to-high transition on the falling edge of 02, rather than the rising edge. This means that while 01 will make its required transition, 02 will not make a high-to-low transition during PSYNC.

Since the Z-80 doesn't use @1, simply invert @2TTL before it gets to the Z-80, so that /MREQ will make PSYNC occur at the right time.

I wrote Ithaca about this problem, but they weren't interested, so you'll have to modify your own board. Refer to Fig. 3 for details. All mods are done on the solder side of the board.

- 1. Remove R6 (330  $\Omega$  orange-orange-brown) carefully and save it.
- 2. Cut the third trace from the top on the solder side, right near U12 where it makes an angle (see Fig. 3).
- 3. With U12 at the top, connect the side on the right to U12, pin 5.
- 4. Connect the left side (going to the CPU) to pin 6. The wires should criss-cross. As with all PCB mods, use #30 Kynar wire-wrapping wire or equivalent.
- 5. Connect R6 between pin 14 and pin 6 of U12.

This completes the modification, and all of the boards mentioned above should operate correctly. ■

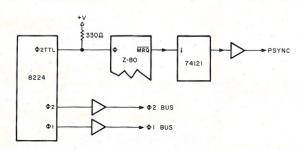


Fig. 1.

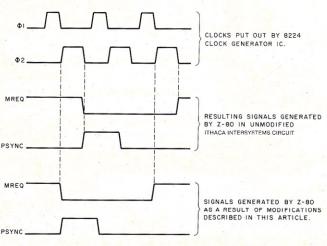


Fig. 2.

To our customers.

Every month our prices prove to be the rival of the entire industry. Of course our competetion will boast that they will meet or beat our price, but before you believe that ask these questions: Will they allow a 2% discount starting with the order that makes your total business with them exceed \$1000.00? Will they allow an additional 3% whenever you send a check instead of using a credit card? Will they pay the shipping on all orders over \$100.00?

These are company policies that we adhere to. No one forced us to do it just because their advertised prices were lower than ours! It is simply the way we do our business every day. Go ahead and call our competetion. Then call us to place your order. Join our family of satisfied friends today. Our phone is answered 24 hours per for your convienence.

	COMPUTER SYSTEM\$780.00
400	COMPUTER SYSTEM\$440.00
850	INTERFACE MODULE\$171.22
810	DISK DRIVE\$540.00
820	PRINTER\$450.00
8K	RAM\$ 93.75
16K	RAM\$148.55

SPECIAL STAR RAIDERS..... \$ 43.20

> BY THE TIME THAT THIS GOES TO PRESS WILL HAVE THE NEW HOBBY COMPUTER BY MATTEL. CALL FOR PRICES ON THE NEW INTELLIVISION. RESERVE ONE FOR CHRISTMAS NOW.

ANALYTICAL SYSTEMS 19 P.O. BOX 3 OAK RIDGE, TN. 37830

(615) 691 - 3772

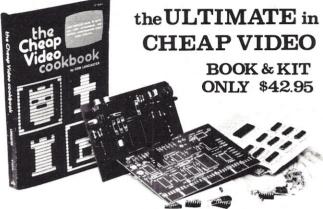


Texas Instruments TI-994 Home Computer. Designed to be the first true home computer — for skilled computer users

99/4 CONSOLE\$808.00
COLOR MONITOR\$402.00
SPEECH SYN\$134.58
RS-232\$194.06
DISK CONTROLLER\$258.75
DISK DRIVE\$431.25
PRINTER\$334.65
MODEM\$194.06

WE ALSO CARRY A FULL LINE OF SOFTWARE WE ALSO CARRY A FULL LINE OF SOFTWARE FOR TI AND ATARI AT VERY ATTRACTIVE PRICES. WRITE OR CALL FOR SPECIFICS. BE SURE TO WRITE FOR OUR NEW CATALOG NOW BIGGER THAN EVER!

r P.C. layout ready ny scale up to 4:1 ide a negative or a to tell us which for you to contact CIRCUITS and us ree camera any scari will provide a n
ive (Be sure to tr send the ca 00



Don Lancaster's "Cheap Video" concept allows almost unlimited options, including:

- \* Scrolling · Full performance cursor.
- Line/Character formats of 16/32, 24/80, 32/64.... or almost anything.
- Graphics-up to 256 X 256 B &W; 96 X 128 COLOR (requires low-cost option modules)
- \* Works with 6502, 6800 and other micros.

ELECTRONICS, Dept. 10K 1020 WILSHIRE BLVD., OKLAHOMA CITY, OK 73116

SPECIAL OFFER: Buy the Kit (upper case alphanumeric option included) & get the Book at 1/2 price.

ELECTRONICS,	1020 W. WILSHIRE	BLVD., OKLAHOMA CITY,	. OK 73116
I'm Sold, PLEASE RU	~~~~~~	() SEND FREE	
	t & Cheap Video Cook		∠ 106
	tonly (book require		,
name:			
address:			
city:	state:	zip:	

# MICROPROCESSOR



CPU Board can be expanded into a stand alone microcomputer system or used by itself as a dedicated controller for OEM applications. Includes a complete step-bystep instruction manual on 8085 operation and architecture. 8085 based CPU board is expandable with 1K eprom, 1K read/write memory, one serial port and three programmable parallel ports. 44 pin CPU edge con-nector can be configured for any buss structure. Area on CPU board for custom

wirewrap design of user defined interface circuitry. \$249.95 Per Kit \$299.95 Asser

8085A COOKBOOK Basic concepts, system control, memory systems and types, interfacing, 8085A--family-compatible chips. You design several completely operational 8085A-based microcomputers.

8080/8085 SOFTWARE DESIGN A detailed approach to assembly language programming for 8080 or 8085-based computers. Including complete, tested No. 21541

TRS-80 INTERFACING Use basic language to control external devices and sense external events. Level II basic and 4K available memory required.

> No. 21633 \$8.95

No. 21447

14905 NE 40TH, DEPT, K10 REDMOND, WA 98052 (206 883-9200)

		Add \$2.50 postag	ge and nanding.		
ENCLO	SED IS \$		FOR	EACH:	
□KIT	□сооквоок	□ SOFTWARE DESIGN	☐ TRS-80 INTER	FACING	
NAME				A 7 10 C	
ADDRE	SS				
CITY, S	TATE, ZIP		and the second s		
CARD NO. EXP.					
SIGNAT	TURE				
SEND	FOR OUR FREE	PAGE CATALOG		A D METCD	

#### MID ERST MIDIR -86 PH (219) 293-4316/10-8 EST / For C.O.D. INFORMATION

....TERMINALS/ ADDS 20....\$799/25....\$849/ HAZELTINE 1410...\$749/ i500...\$949/ 1510....\$1049/ 1520....\$1295 TERMINALS/ HEATH-ZENITH WH-19....\$849/ PERKINS-ELMER...\$729/ INFOTON 100....\$849/ MICRO TERM ACT5....\$749 TERMINALS/ LEAR-SIEGLER ADM-1A....\$1359/ ADM-3.(assm.)....\$799/ ADM-31...\$1159/ LOWER CASE-NUM. PAD. (avail) . . ... SYSTEMS/ PASCAL MICROENGINE (board)....\$1549/ CAB. & PW SUPP.... \$2295/ PASCAL PLUS (2 drives)....\$2995. . . . .SYSTEMS/ HEATH-ZENITH WH-89 (16K)....\$1899/ CROMEMCO SYS-3 (64K, 1.2M dr.)....\$5349/ Z2D-W (assm.)....\$1839 . ..... SYSTEM/ NORTHSTAR HOZ. 1(32K DD)....\$2895/ HOR. 1(16K DD)....\$2400/ SWTC 6809(56K)....\$1695. PRINTERS/ TEXAS INSTRUMENTS 810....\$1529/ 820K0...\$1959/ DIABLO 1640... \$2779/ 1650...\$2995 . . PRINTERS/ NEC 5510....\$2499/ 5520K0....\$2895/ 5530P....\$2499/ HEATH ZENITH WH-14....\$779. PRINTERS/ CENTRONICS 730 ...\$775/ 799 2...\$995/ 702... \$1725/ COMPRINT 912GP...\$499/ 912S...\$529. . SUPPORT/ SEATTLE COMPUTER PROD.(16K memory plus 250ns static)....\$279/ CENTRONICS RIBBONS/ NEC RIBBONS SUPPORT/ NEC THIMBLES/ PRINTER STANDS/ CRT WORK STATIONS/ CIRCUIT MANUALS/ RS-232 CONNNECTORS. . SUPPORT/ T.D.M. Disckettes 8" (TRS Mod. 2) Box 10....\$45/ 8" SS Box 10....\$35/ 54" SS Box 10....\$35 EANDLING Freight Collect- TO ORDER Cert. Personal Ck COD P.O. Box 621, BRISTOL, IN 46507

# PARALLEL I/0 FOR THE TRS-80

As featured in 80 Microcomputing, September 1980 issue.

The PPI-80 is a complete parallel I/0 interface designed specifically for the TRS-80, consisting of 3 complete 8 bit 1/0 ports including such features as:

- switch selectable address decoding
- complete on board regulated power supply
- TTL compatible I/0 lines conveniently available through 16 pin sockets
- +5 volts and ground at each socket
- 3 software selectable modes of operation
- handshaking
- plugs into keyboard or expansion interface
- on board kluge area for experimenting provisions for interfacing Sears-BSR-RS home controller

#### Possible applications include:

- bidirectional communication between microcomputers
- parallel printer interface
- wireless home control via BSR home controller
- direct control of lights, appliances, and motors
- interfaces to many popular boards including A/D-D/A converter and an EPROM Programmer

#### PPI-80 is available now and can be purchased in several forms

Completely assembled and tested	\$124.95
Complete kit with all parts	\$ 95.00
Bare board drilled and etched with assembly manual	\$ 27.95
Accessories:	
O abased A/D O abased D/A by Oatised Tasked	****

8 channel A/D - 2 channel D/A by Optimal Technology . . . . . . \$115.00 EPROM Programmer Model EP-2A-79 by Optimal Technology .155.00

To order, send payment plus \$2.00 shipping and handling to:

QUANT SYSTEMS P.O. BOX 628 CHARLESTON, S.C. 29402



S.C. residents add 4% sales tax Overseas orders add \$5 for shipping

p.o. box 628 charleston sc



#### A PROFESSIONAL DATA BASE MANAGER FOR NORTH STAR OPERATING SYSTEMS.

If you've been struggling with random access pointers, churning out pages of BASIC code every time your program needs a new file, then DBMS-1 is for you!

This data base management system allows you to dynamically create files with up to ten named, variable length fields. Alpha, numeric and spacesaving table lookup fields are supported. Your data is stored linked sequential and automatically arranged binary tree fashion for fast, keyed searches. Records can be amended, deleted, listed alphabetically or summed on multiple keys.

Sophisticated "Wild Card" search procedures allow nearly limitless sorting possibilities. There are extensive "help" routines (for instance, you can recall your field names, parameters and record numbers at any time).

But best of all, DBMS-1 performs ALL searching and sorting IN PLACE. That means your files don't have to be in RAM. Access to files by other programs is easy - DBMS-1 provides header and record sizes and other information on request.

The DBMS-1 system is a series of linking modules which run under NORTH STAR BASIC, Release 4.0 or 5.0 with a minimum of 12K of RAM.

Price of the Diskette is \$125. (US), which includes a fully commented version of DBMS-1 and a condensed "Go" file. A sample data file is included for experimentation. The extensive user's manual may be ordered separately for \$15., refundable on purchase of the DBMS-1. One year's FREE update service is also yours.

#### Order Post Paid From:

THE SOFTWARE DIVISION 

✓ 312 LAKE CITY TECHNICAL PRODUCTS No. 5 - 1952 SPALL ROAD KELOWNA, BRITISH COLUMBIA CANADA V1Y 4R1

A Comprehensive Guide to Programs

Now, you can have access to hundreds of computer programs, quickly and easily.

The Software Directory lists available programs for major home and small business computers, including Apple...Atari...North Star...Radio Shack...PET...CP/M Systems and more.

Indexed for fast and easy reference, Directory categories include games, education, utilities, home accounting, and professional business programs. It's organized according to computer type, so you can find the programs designed for your computer, fast.

The Software Directory describes each program, and lists the minimum required system, program price, ordering information and vendor address.

The Software Directory has all the information you need for ordering any of the hundreds of software programs available. To get it, send a check or money order for \$9.95 to Software Central. We'll send you a software reference book you'll use time and again.



Software Central P.O. Box 30424 Dept. K Lincoln, NE 68503

**1**46

# M-n-M's



High quality S-100 mainframes with integrated dual disk drives, need only your standard S-100 boards (or ours) to complete the system.

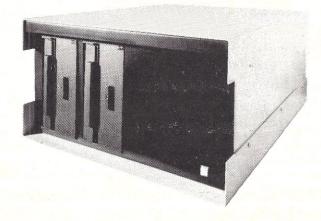
Standard features include reset-glo-button, keyed on/off power switch that also powers-on dual outlets on the rear panel for peripheral devices. 'Quasi-coaxial' S-100 Motherboard\* with adaptive termination assures you of 'silent' operation. Heavyduty linear power supply supports both the Motherboard and disk drives.

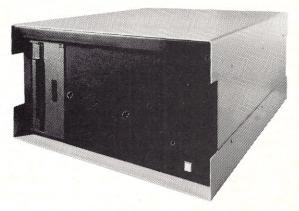
- \*All have 10 slot Motherboard/card guides
- \*Optional rack mount version with only 5 slots—but is available in 2-cabinet version with 15 slots and horizontal dual drives in second cabinet.

Delivery-2 to 4 Weeks

MnM8/1Mb-11,69500 Dual Remex RFD-2,000's

MnM8/2Mb-\$2,14500 Dual Remex RFD-4,000's





MnM-HD8/7 + 1Mb-\$4,69500 MnM-HD8/21 + 1Mb-55,69500 MnM-HD8/35 + 1Mb- \$6,59500

8" Micropolis Hard Disk + 1 RFD-4000 Floppy Disk



INTELLIGENT BUSINESS MACHINES CORPORATION 1612 E. Shleids • Fresno, CA 93704 • (209) 222 • 3302

# **Dial-up Directory**

#### Meet the father of Forum-80, Bill Abney.

Frank J. Derfler, Jr. PO Box 691 Herndon, VA 22070

f you've read the Dial-up Directory listings, you've seen the title Forum-80. In previous articles I've examined Computer Bulletin Board Systems Chicago-style, Apple Bulletin Board Systems by Bill Blue and two North Star systems. For this issué, I visited the creator of the Forum-80, Bill Abney, to find out more about making Radio Shack's TRS-80 into an electronic bulletin board and program transfer system.

Bill: "I'm only one deep, Frank. I receive calls from my Forum-80 operators around the country and constantly try to help them with problems. I have almost no time to answer other inquiries. My stack of letters right now is about four inches deep."

Microcomputing: "You used a phrase there, Bill. You said, 'my operators.' It has been said that you have a very strong proprietary feeling about Forum-80 systems, despite the fact that each one is run by other private individuals."

Bill: "I refer to the Forum-80 network. It is

not a network of stations that is permanently interconnected, but the interconnection is there at several levels. The users check into different systems and carry information between them. The system operators also swap messages between the sys-

"I feel it is very important to keep compatibility and uniformity between the Forum-80 operations. Some operators would like to make changes in their systems to provide unique services, but they can't do it with the existing software. The version 2.1 software has been expanded about as far as it can go while still maintaining uniformity. There have been other problems too."

Microcomputing: "Like what?"

Bill: "Software sharks for one. Bandits who make very small changes in my software and sell it themselves. I stopped putting out any more 2.1 software in December 1979 and fired up a version 3.0 in February 1980. The new version will give the Forum operators the flexibility to provide all the special features they like while maintaining uniformity for the user. Version 3.0 will be provided to the Forum operators, but they will not own it. It will be licensed like other commercial software. New licenses will cost about \$150."

Microcomputing: "How will you allow more versatility in the program?"

Bill: "Version 3.0 will allow branching into special-purpose subroutines, but the system will initially come up looking like any other Forum-80 to the users. Users can then treat the system as a standard Forum-80 or move into special uses."

```
Forum Augusta, GA
                            (3.0) 803-279-5392
Forum Boston, MA
                            (3.0)
                                  617-431-1699
Forum Chicago, IL
                                 312-782-8180
Forum Cleveland, OH
                                 216-486-4176
Forum Dallas, TX
                                 214-288-4859
Forum Denver, CO
                                 303-789-0936
Forum Fairfax, VA
                                 703-978-7561 (Genealogy)
Forum Ft. Lauderdale, FL
                            (3.0)
                                 305-772-4444
Forum Kansas City, MO
                            (3.0) 816-861-7040 (H.Q. SYS)
Forum Kansas City, MO
                            (3.0)
                                 816-931-9316 (Commodities)
Forum Las Vegas, NV
                            (3.0)
                                 702-873-9491
Forum Memphis, TN
                                 901-276-8196
                            (3.0)
Forum Memphis, TN
                           (3.0) 901-362-2222 (Hobbyist)
Forum Mt. Clemens, MI
                                 313-465-9531 (Medical)
                            (3.0)
Forum San Francisco, CA
                                 415-348-2139
                           (3.0)
                                 813-223-7688
Forum Tampa, FL
                           (2.1)
Forum Union, NJ
                           (3.0)
                                 201-688-7117
Forum Ventura County, CA
                           (2.1)
                                 805-484-9904
Forum Wichita, KS
                                 316-746-2078
                           (3.0)
Forum Wichita Falls, TX
                                 817-855-3916
                           (2.1)
```

In honor of our interview with Forum-80 founder, Bill Abney, I will limit our system list this month to Forum systems. Bill has provided this current (as of publication deadline) list of active Forum-80 systems. The number in parentheses refers to the version of software in use. Version 3.0 has the most complete set of features. Some of these numbers may be redundant to previous lists. Some of the most interesting special-user systems are running with the Forum-80 software.



Bill Abney, the Forum-80 founding father. Bill provides a lot of support for his Forum-80 operators, but wishes he had time to do more.

Microcomputing: "You mean uses like family history and medical applications?"

Bill: "Yes. I have heard of a specialinterest system for photographers too. Some operators may want to provide special services, graphics, programs to run, user codes and many other things. These submenus can be used by the people they are intended for, while other, less sophisticated, users see the basic Forum-80 menu come up in default. I would expect the operators to contribute submenu software to the network pool so it can be shared where appropriate.'

Microcomputing: "Aside from the software, what does a person need to set up a Forum-80?

Bill: "They need a TRS-80 with 48K of memory. This means they need the expansion interface. It has to have the RS-232 card installed. They need three disk drives for version 3.0. With the older version the third disk was optional, but it is needed in this version. They also need an automatic answer modem. This will give the full Forum capability."

Microcomputing: "That looks like a \$3500 system at retail prices. What kind of modem do vou recommend?"

Bill: "I think the U.S. Robotics auto answer modem is a tremendous piece of equipment. It is well designed and interfaces with the TRS-80 very well."

Microcomputing: "The Forum-80 in Kansas City (816-861-7040) is referred to as the 'headquarters.' Is it a very active system?"

Bill: "This system is more for demonstration than anything else. It is the only computer I own, and I use it for all the development work, so it is on the phone as a forum at odd hours. However, during the online hours, the Forum-80 Headquarters System serves many regular and long-distance us-

Microcomputing: "How did you arrive at the Forum-80 name?"

Bill: "I felt that the term Bulletin Board implied merely a place to post notices. A forum is more a place of public discussion. In this view, I hoped the Forum would become a place where the microcomputer user could discuss his pursuits and exchange intelligence with others. I feel the educational value is immense, both for the beginners and the experienced users. The 80 in the name, of course, came from the TRS-80, but with the 3.0 system we are attempting to achieve compatibility with other machines and prefer to look at it as the 'Forum of the 80s.' "

Microcomputing: "What else would you like our readers to know, Bill?"

Bill: "That's easy! Please tell them to use and read the help commands available on every system. If they use trial and error learning to find all of the Forum's features, they will be frustrated, will probably miss something and will keep the system busy for much longer than it needs to be. If they send a self-addressed legal-size envelope with two first-class stamps attached, I will send them a Forum-80 user's guide. I would much rather pay to print up this guide than have people tie up systems. It is nothing

fancy, but it is useful. I hope they read it."

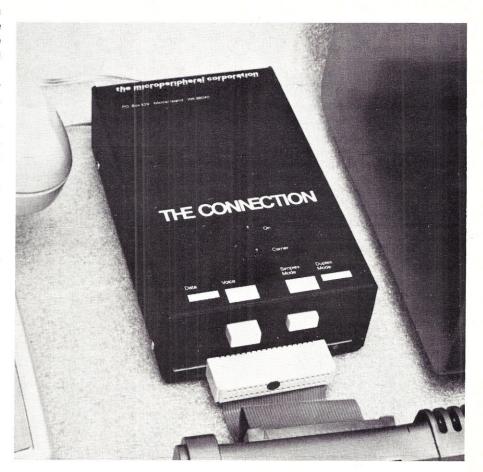
Send your large double-stamped self-addressed envelopes to: Forum-80 Headquarters, 7600 E. 48th Terrace, Kansas City, MO 64129.

#### The Micro-Connection

Here are two names for you: The Peripheral People and Don Stoner. The first name was new to me, but the second has been familiar for a long time. Don Stoner is better known to the amateur radio world as W6TNS. He has been involved in radio equipment design and manufacturing at several different levels. The Peripheral People is the name of Don's company in Washington state.

These names are interesting, particularly to TRS-80 users, because of their new product called the Micro-Connection. Basically a modem, this device connects directly to the phone line so you don't need an acoustic coupler. (Acoustic couplers and telephone handsets sometimes cause distortion, and can be the entry point for disruptive noise.)

This device will interface with all TRS-80 models I, II and III, as well as the TRS-80 Color Computer; any memory size; any type of BASIC; and with or without an expansion interface. Previously, a computerist needed



The Micro-Connection modem in operation. It is a small, convenient device with great capabilities.

the expansion interface and had to install the RS-232 card to use a modem for telecommunications. This called for a \$400 investment before you even got to the modem price.

The Micro-Connection is selling for \$249. It plugs into the TRS-80 bus connector, or can plug directly into the screen printer port of the expansion module.

The Micro-Connection also has a female RS-232 output connector on the modem. Thus, a serial printer can print along with the modem and provide hard copy of everything on the screen, without fancy software. This provides a port that is separate from the regular TRS-80 RS-232 card. You can operate the Micro-Connection as just an interface between the TRS-80 and any RS-232 device - it does not have to be operating as a modem to give RS-232 output. This means you can run a series printer without the expansion interface and RS-232 card. Do you understand why they call it the Micro-Connection?

Finally, since Don is an active amateur radio operator, the literature for the Micro-Connection points out that you can use this device with an amateur radio station to transmit and receive ASCII. This can be done with any modem, of course, but the configuration of the Micro-Connection makes it easy to get at the audio input and

audio output lines for interconnection to the radios. Since the FCC made ASCII transmission legal in March, this has become an very important consideration for modem users and manufacturers.

For more information on the Micro-Connection, contact The Peripheral People at PO Box 524, Mercer Island, WA 98040. They also run their own bulletin board system at 206-723-DATA.

#### Random Noise

Some users of Novation CAT and other acoustically coupled modems have written to say that they have some intermittent distortion problems that seem to involve the telephone handset. The cures include everything from putting cotton in the earpiece cup to using strange chants and incantations.

These cures sound like the medieval treatment for the plague, but there is a little science behind them. Part of the science involves doing something - anything - to unpack the carbon granules in the telephone mouthpiece. The old-time ham radio operators used to broadcast with a pencil in one hand and tap the microphone periodically to unpack the carbon.

Got a transmission problem with an acoustically coupled modem? Made sure the phone is tightly seated and the environ-

ment is free of outside noise and bang the phone mouthpiece against your palm once or twice. It might help.

Also, the carbon microphones create a second harmonic feedback through the handset back to the earpiece, thereby creating distortion in the modem input side. That may explain why cotton around the inside of the earpiece sometimes helps. It can dampen the second harmonic vibration. Just don't cover up the sound holes or cut down on the level of the tones you want.

Novation is coming out with a dynamic element to replace the carbon one in your telephone if it becomes a persistent problem. This element will do away with both carbon packing and second harmonic resonance.

This is another argument in favor of direct-coupled modems. They aren't as portable, but they may provide more reliable operation.

#### **Data Transfer**

Send me your data! If you have comments, questions or information about computer bulletin board services or other aspects of data transmission, let me know. Use the address at the beginning of the article or send it to TCB967 on The Source. Send a stamped envelope if you want a response to paper mail.



#### THE ORIGINAL MAGAZINE FOR OWNERS OF THE TRS-80™\* MICROCOMPUTER

SOFTWARE FOR TRS-80" OWNERS

# 

MONTHLY NEWSMAGAZINE FOR TRS.80"

## MONTHLY NEWSMAGAZINE Practical Support For Model I & II

- PRACTICAL APPLICATIONS
- BUSINESS
- GAMBLING GAMES
- EDUCATION
- PERSONAL FINANCE
- BEGINNER'S CORNER
- NEW PRODUCTS
- SOFTWARE EXCHANGE
- MARKET PLACE
- QUESTIONS AND ANSWERS
- PROGRAM PRINTOUTS . . . . AND MORE

PROGRAMS AND ARTICLES PUBLISHED IN OUR FIRST 12 ISSUES INCLUDE THE FOLLOWING:

- A COMPLETE INCOME TAX PROGRAM (LONG AND SHORT FORM)
- INVENTORY CONTROL
- STOCK MARKET ANALYSIS
- WORD PROCESSING PROGRAM (FOR DISK OR CASSETTE)
- LOWER CASE MODIFICATION FOR YOUR VIDEO MONITOR OR PRINTER
- PAYROLL (FEDERAL TAX WITHHOLDING PROGRAM)
  EXTEND 16-DIGIT ACCURACY TO TRS-80™ FUNCTIONS (SUCH AS
- SQUARE ROOTS AND TRIGONOMETRIC FUNCTIONS)
- NEW DISK DRIVES FOR YOUR TRS-80™
- PRINTER OPTIONS AVAILABLE FOR YOUR TRS-80" A HORSE SELECTION SYSTEM\*\*\*ARITHMETIC TEACHER
- COMPLETE MAILING LIST PROGRAMS (BOTH FOR DISK OR CASSETTE SEQUENTIAL AND RANDOM ACCESS)
- RANDOM SAMPLING\*\*\*BAR GRAPH
- CHECKBOOK MAINTENANCE PROGRAM LEVEL II UPDATES\*\*\*LEVEL II INDEX
- CREDIT CARD INFORMATION STORAGE FILE
- BEGINNER'S GUIDE TO MACHINE LANGUAGE AND ASSEMBLY LANGUAGE
- LINE RENUMBERING
- AND CASSETTE TIPS, PROGRAM HINTS, LATEST PRODUCTS COMING SOON (GENERAL LEDGER, ACCOUNTS PAYABLE AND RECEIVABLE, FORTRAN-80, FINANCIAL APPLICATIONS PACKAGE, PROGRAMS FOR HOMEOWNERS, MERGE TWO PROGRAMS, STATISTICAL AND MATHEMATICAL PROGRAMS (BOTH ELEMENTARY AND ADVANCED) . . . AND

FREE

WORD PROCESSING PROGRAM (Cassette or Disk) For writing letters, text, mailing lists, etc., with each new subscriptions or renewal.

LEVEL II RAM TEST (Cassette or Disk) Checks random access memory to ensure that all memory locations are working properly.

DATA MANAGEMENT SYSTEM (Cassette or Disk) Complete file management for your TRS-80"

CLEANUP (Cassette or Disk) Fast action Maze Game

ADVENTURE (Cassette or Disk) Adventure #0 by Scott Adams (From Adventureland International)

\* TRS-80" IS A TRADEMARK OF TANDY CORP

SEND FOR OUR NEW 48 PAGE SOFTWARE CATALOG (INCLUDING LISTINGS OF HUNDREDS OF TRS-80™ PROGRAMS AVAILABLE ON CASSETTE AND DISKETTE). \$2.00 OR FREE WITH EACH SUBSCRIPTIONS OR SAMPLE ISSUE.

50 N. PASCACK ROAD



HOUR



**NEW TOLL-FREE** ORDER LINE

AING VALLET, NEW TORK 109	//	24 ORDER	VISA.	(OUTSIDE OF N.Y. STATE
ONE YEAR SUBSCRIPTION	\$24 L	LINE		(800) 431-2818
TWO YEAR SUBSCRIPTION	\$48	(914) 425-1535		(000) 101 201
SAMPLE OF LATEST ISSUE	\$ 4	(314) 423-1303	NE	W/000
START MY SUBSCRIPTION V	VITH ISSUE			NEWSLETTER
(#1 - July 1978 • #7 - Ja	anuary 1979 • #12 - June 1 . RENEWAL	979 ● #18 - January 1980)	(	ar (or 12 issues)
CREDIT CARD NUMBER			EXP. DA	TE
SIGNATURE	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			
NAME				
ADDRESS	CITY	STATE		ZIP
*** AD	D \$6/YEAR (CANADA MEXICO)	ADD \$12/VEAR AIR MAIL - OUTSIDE OF U.S.A.	CANADA & MEXIC	0 ***

# Reduce Search Time With an Index

## The author shows how you can breeze through file searches with this Heath H8 program.

LeRoy E. Kolderup 1497 Sugartown Road Paoli, PA 19301

icroprocessors are frequently used in business applications to search long files for a specific record. Such a search is usually made by moving the file into main memory and using a BASIC routine of the type shown in Listing 1, where a name (N\$) is used as a key to locate a record (M\$[K]). A print of this record supplies the desired information contained in the remainder of the record, which might include address, date of last order and so on.

The limitations imposed by BASIC and by sequential files make a search through several hundred records a time-consuming task that would try anyone's patience. But the time can be significantly reduced by using an index.

A file can be indexed in many ways, but some methods are elaborate and unsuitable for use on a small system with limited memory. The indexing system described here uses less than 100 bytes of memory, can be easily generated and will reduce search time by a factor of from ten to 20.

In a business application, the principle key with which a search is made might be the name of an individual or company. The records can be arranged in alphabetic order of the principle key. The index system that will be described supplies the record number of the first record that begins with each letter of the alphabet. This information is then used to limit the area of search to a specific portion of the file.

#### Generating the Index System

The first step in generating this index is to sort the file, if it is not already in alphabetic order. This step need only be repeated when additional records are added to a file. For files of any significant length, the sort technique should be more advanced than the overused bubble sort to avoid excessive sorting times. Such techniques as the Shell-Metzner sort or Hoare's Quicksort have been described in detail and will not be repeated here (see "Quicksort," Microcomputing, April 1979, p. 96).

The second step generates an index that lists the record number of the first record that starts each alphabetic character group. If the file contains records that begin with the letter A, its index value will, of course, be 1. If the first record that has a key beginning with the letter G is record number 145, then the index for G will be 145. If there is no record beginning with a particular alphabetic character, its index is made equal to the number of the last record in the file.

A program to generate this index is given in Listing 2. I presume that the file to be indexed is formatted with the keyword at the beginning of each record, has been sorted alphabetically and resides on disk. Lines 10 through 80 constitute the input routine to load the file into memory. This program was prepared on a Heath H8, and some modifications may be required for other disk systems or for a tape system.

The last record in the file is a special record that contains two numeric zeros in character format (00) as the two leading characters. Note that detection of this pair of zeros in line 50 serves as a convenient end-of-file marker. If the file has not been previously indexed, then this character pair should be appended as the final record before using the index generator.

Lines 120 through 190 generate the index, I(A) for A=1 to 26. Line 140 initially compares the ASCII code of the first character of the record with the code for the character A. If they do not compare, no records start with A, and the index value assigned to I(1) is the value of the final record. The next character in the alphabet is then selected and the process is repeated. If the comparison is true, then I(1) is set equal to one in line 150.

Line 160 selects the next record and checks for the end-of-file in line 170. Line 180 compares the first character of the record with that of the previous record and continues selecting the next record until a line beginning with a different character is reached. The program then goes to the next alphabetic character and repeats until all characters of the alphabet have been indexed by assigning the number of the record that first begins with each letter of the alphabet to the index I(A).

Lines 210 through 240 pack this index into a single string that is structured to require a minimum of file space and can be

```
>LIST EXAMPLE.BAS
00120 IMPUT "NAME? "; N$
00130 IF N$="$TOP" THEN 190
00140 FOR K=1 TO 400
00150 IF LEFT$(M$(K),LEN(N$))=N$ THEN PRINT M$(K):GOTO 120
00160 NEXT K
00170 PRINT "NO MATCH FOUND"
00180 GOTO 120
00190 END
>

Listing 1. Typical file search routine.
```

```
>LIST INDEXGEN.BAS
00005 REM FILE INPUT ROUTINE
00010 DIN M$(400), I(26)
00020 OPEN "TESTFILE" FOR READ AS FILE #1
00030 FOR K=1 TO 400
00040 LINE INPUT #1,; M$(K)
00050 IF LEFT$(H$(K),2)="00" THEN 70
00060 NEXT K
00070 CLOSE #1
00080 Z=K-1
00090 REM END OF FILE INPUT
00110 REM BEGIN INDEX GENERATION
00120 K=1
00130 FOR A=1 TO 26
00135 REH CHECK FOR HATCH OF 1ST CHARACTER OF RECORD AND ALPHA CHARACTER
00140 IF ASC(M$(K)) <> A+64 THEN I(A)=Z:GOTO 190
00145 REM ASSIGN RECORD NO. AS INDEX VALUE
00150 I(A)=K
00155 REM SELECT NEXT RECORD, CHECK FOR END OF FILE
00160 K=K+1
00170 IF LEFT$(M$(K),2)="00" THEN 190
00175 REM IF 1ST CHARACTER OF RECORD MATCHES THAT OF PRECEEDING RECORD
                   THEN NEXT RECORD
00177 REM
00180 IF ASC(M$(K))=ASC(M$(K-1)) THEN 160
00190 NEXT A
00200 REM GENERATE INDEX STRING AND APPEND TO FILE
00210 I$="00"
00220 FOR A=1 TO 26
00230 I$=I$+LEFT$(RIGHT$(" "+STR$(I(A)),4),3)
00240 NEXT A
00250 H$(Z+1)=I$
00260 REM END OF INDEX GENERATION
00290 REM WRITE FILE WITH INDEX APPENDED BACK TO DISK
00300 OPEN "TESTFILE" FOR WRITE AS FILE #1
00310 FOR K=1 TO Z+1
00320 PRINT #1, M$(K)
00330 NEXT K
00340 CLOSE #1
00350 END
```

Listing 2. Program to generate a file index.

```
*PRINT IS
   1 16 58 94106118145178387211217238259280289292387310328358387387367387382387
```

Listing 3. Format of index string.

easily decoded in the search routine. This string begins with the character pair 00 and continues with three digits allocated for each index entry. Line 230 converts the index value for each I(A) to character format. strips the trailing zero and either adds or strips leading zeros to make all entries have a length of three characters. (A file with more than 999 records will require this routine to be modified to allow for four characters.) These values are then strung together to form the index string.

Listing 3 illustrates the format of the index string for a typical file. In this example, the first record in the file begins with A, record 16 is the first record beginning with B, record 58 with C and so on. No records begin with the letters I, Q, U, V, X and Z; therefore, these letters are indexed to 387, the last record in the file. Line 250 appends this index string to the end of the file. Lines 300 through 340 write the file with the appended index back to disk.

#### Searching the Index

The indexed file is now ready for a rapid search. Changes to a record (other than the first character of the keyword) or deletion of a record can be made without requiring the generation of a new index.

A typical program for searching the indexed file is shown in Listing 4. Lines 10 through 70 contain the input routine to load the file together with the index string into memory. Lines 80 through 110 decode the index string into 26 index values for I(A). These values are then used in line 140 of the search routine to confine the search to those records that begin with the same character as the key. If no records that start with this character are present, the search is indexed to the end of the file and the "NO MATCH FOUND" message is immediately displayed.

#### **BUSINESS** SOFTWARE

#### DATEBOOK<sup>TM</sup>

**NEW!** for NorthStar, Micropolis, TRS-80 Mod II & any other CP/M based operating system.

End paging through an appointment book forever! Easy to learn & use.

- ★ Replaces your office appointment book
- Searches for openings that fit time of day, day of week & day of year constraints
- Appointments made, modified or cancelled by a few key strokes
- Copies of day's appointments can be quickly printed
- Schedule appointments 4 months in advance - plus

\$295. Manual alone - \$25.

#### TEXTWRITER III™

**NEW FEATURES!** a text formatting program for North-Star & TRS-80 DOS, Micropolis MDOS & any CP/M based system.

- \* Proportional spacing & enhanced printing for
  - Diablo Qume NEC printers
- Enhanced printing includes ribbon color change, dual pitch, reverse line feed.
  - UNDERSCORE
  - BOLDFACE
  - DOUBLE STRIKE
  - · STRIKEOUT
  - SUBSCRIPT
  - SUPERSCRIPT
- Allows for optional left justified page headings on even numbered pages & right justified on odd numbered pages

\$125. Manual alone - \$25.

#### $MAILROOM^{TM}$

Sophisticated mailing list facility. HELP & EXPLAIN commands to guide user through operation of system. Data base is flexible enough to permit selection on a complex set of criteria. Capacity is limited only by the available disk storage

\$175. Requires CP/M & CBASIC

CBASIC2™ \$95. Manual alone - \$15.

#### DIGITAL >38 MARKETING

2670 Cherry Lane Walnut Creek, CA 94596 (415) 938-2880

DATEBOOK & TEXTWRITER are trademarks of Organic Software
MAILROOM is a trademark of The Software CBASIC is a trademark of Compiler Systems Inc TRS-80 is a trademark of Radio Shack
CP/M is a trademark of Digital Research
Outside the USA add \$10. for postage & handling The program was tested using a file containing 387 records. The index generation process (lines 120 through 250, Listing 2) was completed in 90 seconds after the file was loaded into memory. (File load and dump time will vary with record lengths and distribution of a file on the disk sectors.)

The file was then searched for several records scattered throughout, using the last name as a key and printing out the complete record as the response. I used the program contained in Listing 4. The response times varied from one to six seconds, with an average of 2.6 seconds.

```
>LIST OSEARCH.BAS
00005 REM FILE INPUT ROUTINE
00010 BIH M$(400), I(26)
00020 OPEN "TESTFILE" FOR READ AS FILE #1
00030 FOR K=1 TO 400
00040 LINE INPUT #1,;M$(K)
00050 IF LEFT$(N$(K),2)="00" THEN 70
00060 NEXT K
00070 CLOSE #1
00075 REM DECODE INDEX STRING
00080 I$=M$(K)
00090 FOR A=1 TO 26
00100 I(A)=VAL(MID$(I$,3*A,3))
00110 NEXT A
00115 REM FILE SEARCH ROUTINE
00120 INPUT "NAME?
00130 IF N$="STOP" THEN 190
00140 FOR K=I(ASC(N$)-64) TO I(ASC(N$)-63)
00150 IF LEFT$(M$(K),LEN(N$))=N$ THEN PRINT M$(K):GOTO 120
00160 NEXT K
00170 PRINT "NO MATCH FOUND"
00180 GOTO 120
00190 END
```

Listing 4. Search program for an indexed file.

I repeated the test without the benefit of an index by changing line 140 to read FOR K=1 TO 400 and deleting lines 80 through 110 from the program in Listing 4. The file was searched for the same records as in the previous test. In this case, the response times varied from three to 66 seconds. As you would expect, the time for any given record was roughly proportional to the record number. The average time of 38 seconds was about 15 times longer than that required with an index.

The above indexing scheme is one of several possible methods of using an index. This one requires little additional memory, has a simple index generation program and requires only a few additional lines to the search routine. It is directly applicable to almost any database file and can be adapted with minor modifications to handle a case where the keyword is located at other than the beginning of a record. It can be used to quickly locate records for both display and update purposes.

Application of this technique to a file with as few as 100 records will pay off in reduced time to locate specific records for display, update or other processing. For larger files, the time saved is significant, and efficient data processing demands the use of an index.

#### 60 Hz CRYSTAL TIME BASE \$4.95 (Complete Kit)

Uses MM5369 CMOS divider IC with high accuracy 3.579545 MHZ Crystal. Use with all MOS Clock Chips or Modules. Draws only 1.5 MA. All parts, data and PC Board included. 100 Hz. same as above, except \$5.95

#### PMD-11K-60

60 Volts. HFE 800-20K 12 Amps. PNP TO-3 150 Watts. By Lambda. BRAND NEW!

\$1.50

#### D.C. HORN

VERY LOUD! 6-12 VDC Like Used In Smoke Alarms. FANTASTIC SAVINGS. Compare this true value.

.60 ea. 4 For \$2.00

## Crystal Super Savings

4.433618 MHZ 2/\$1.10

#### **REPEAT OF A SELL-OUT!**

VECO PRECISION THERMISTOR. GLASS TYPE. VECO #41A72. 8.2K OHMS AT ROOM TEMP. **VERY** SENSITIVE. INDIVIDUALLY PACKAGED IN PLASTIC VIALS. \$3.00 VALUE

\$1.00 each or 3 FOR \$2.50

# MICRO MINI TOGGLE SWITCHES 6 for \$5 with hardware.



99¢

#### \* \* \* \* \* \* \* CABLE TIES \* \* \* \* \*

MAKE YOUR PROJECTS "NEAT & TIDY." 4" CABLE TIES AT A FANTASTIC PRICE. GET THIS BARGAIN AND "TIE" IT DOWN. \$2.00 for 100 or better yet \$15.00 for 1000

#### Digital Research: Parts

(OF TEXAS)

P.O. BOX 401247C GARLAND, TEXAS 75040 . (214) 271-2461

# Video Volley

## Introductory Offer

ALL NEW!

\$795

#### A Full Color\* TV Game For The Family

Six exciting TV Games — Hockey, Tennis and Handball with one or two player capability for each game. Ball velocity doubles after the fourth player hit for an increasingly competitive game.

Adjustable paddle size for each player allows for handicapped play if desired. Paddles can give automatic ball spin with seven possible angles of ball deflection.

Automatic digital scoring appears after each point is scored. Game ceases automatically after one player scores 15 points. Serving is from the paddle of player who scored the last point, thus server can "place" his shot.

Video-Volley is designed to be installed, with a minimum of effort, to any standard television receiver, either color or black and white. Batteries are not required.

Small hand-held player modules with 15 foot cord length provides more comfort and versatility for players.

The compact command module sits atop the television receiver and has front panel control allowing effortless change from normal television reception to game play. Easy disconnection of the player hand-held modules facilitates easy set-up and take-down for storage.

TERMS: Add 50¢ postage, we pay balance. Orders under \$15 add 75¢ handling. No C.O.D. We accept Visa, MasterCharge and American Express cards. Tex. Res. add 5% Tax. Foreign orders (except Canada) add 20% P&H. 90 Day Money Back Guarantee on all items.

# Now NRI takes you inside the world's most popular microcomputer to train you at home as the new breed of computer specialist!

NRI teams up with Radio Shack to teach you how to use, program and service microcomputers...make you the complete technician.

It's no longer enough to be just a programmer or a technician. With microcomputers moving into the fabric of our lives (over 200,000 of the TRS-80™ alone have been sold), interdisciplinary skills are demanded. And NRI can prepare you with the first course of its kind, covering the complete world of the microcomputer.

#### **Learn At Home** in Your Spare Time

With NRI training, the programmer gains practical knowledge of hardware, enabling him to design simpler, more effective programs. And, with advanced programming skills, the technician can test and debug systems quickly and easily.

Only NRI gives you both kinds of training with the convenience of home study. No classroom pressures, no night school, no gasoline wasted. You learn at your convenience, at your own pace. Yet you're always backed by the NRI staff and



Training includes TRS-80 computer, transistorized volt-ohm meter, digital frequency counter, and the NRI Discovery Lab with hundreds of tests

(TRS-80 is a trademark of the Radio Shack division of Tandy Corp.)

your instructor, answering questions, giving you guidance, and helping you over the tough spots.

#### **Explore the TRS-80 Inside and Out**

NRI training is hands-on training. with practical experiments and demonstrations as the very foundation of your knowledge. You don't just program your computer, you introduce and correct faults ...watch how circuits interact...interface with other systems...gain a real insight into its nature.

You also build test instruments and

the NRI Discovery Lab, performing over 60 separate experiments in the process. You learn how your trouble-shooting tools work, and gain greater understanding of the information they give you. Both microcomputer and equipment come as part of your training for you to use and keep.

#### Send for Free Catalog... No Salesman Will Call

Get all the details on this exciting course in NRI's free, 100-page catalog. It shows all equipment, lesson outlines, and facts on other electronics courses such as Complete Communications with CB, TV and Audio, Digital Electronics, and more. Send today, no salesman will ever bother you. Keep up with the latest technology as you learn on the world's most popular computer. If coupon has been used, write to NRI Schools, 3939 Wisconsin Ave., Washington, D.C. 20016.



**NRI Schools** McGraw-Hill Continuing

**Education Center** 3939 Wisconsin Avenue

Washington, D.C. 20016
NO SALESMAN WILL CALL Please check for one free catalog only

- ☐ Computer Electronics Including Microcomputers
- ☐ TV/Audio/Video Systems Servicing ☐ Complete Communications Electronics
- with CB . FCC Licenses . Aircraft, Mobile, Marine Electronics
- ☐ CB Specialists Course

☐ Digital Electronics • Electronic Technology • Basic Electronics

All career courses

approved under GI Bill.

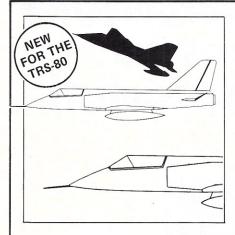
☐ Check for details.

☐ Small Engine Repair

- ☐ Electrical Appliance Servicing ☐ Automotive Mechanics
- ☐ Auto Air Conditioning
- ☐ Air Conditioning, Refrigeration, & Heating including Solar Technology

Name (Please Print) Age Street City/State/Zip Accredited by the Accrediting Commission of the National Home Study Council

# **Great Simulations**



#### Jet Fighter Pilot

The Jet Fighter Pilot package takes you as close to real combat flying as possible...without pulling G's.

In this brilliantly realistic simulation, you become the pilot of a high performance, twin turbo-jet fighter. Total control of the aircraft is yours.

At the start of your mission, you'll go through an entire engine start procedure before your flight (provided your ground maintenance is up to par). Your takeoff will be from either the deck of an aircraft carrier (via a steam catapult) or from an airfield.

All controls respond the same as they would on a real jet fighter. You'll have to constantly monitor your display and make adjustments to your throttle, flaps, rudder and air spoilers. You decide when to retract flaps, landing gear and release the auxiliary fuel droptanks.

Your on-board navigational computer will direct you to your selected airport. The Glideslope/Localizer information will aid you in approaching and landing on an aircraft carrier deck or airfield.

The Weapons Control Computer will arm your missiles, provide you with the range and bearing to a target, and tell you when to attack. And, if things should get a little too hot, you have an ejection seat command for egress.

For a carrier-based landing, you'll have to deploy your tail hook. For a land-based landing, you'll need reverse thrust and your drag chute.

After you've flown a few missions with the Jet Fighter Pilot package, you'll know you've earned your wings.

Order No. 0159R \$14.95



#### **Battleground**

It is late 1944, and the Allied Forces are sweeping toward Berlin. As General in command of your sector, you study the map. At your command, are tanks, planes, artillery, infantry, engineers and vehicles—an awesome array of fighting men and the machines of war. From Intelligence reports you know that the enemy General is a shrewd tactician, not to be under-estimated. It will take planning and strategy to outwit this wily old campaigner.

The battle map of your sector will fill with markers, each showing the deployment of your forces. You and another player will slip into the roles of opposing German and American commanders as yet another battle unfolds.

Battleground allows you to experience the awesome responsibility of a battle-area command. It will be up to you to deploy your tanks, planes, vehicles, weapons and men. On your shoulders rests the decision, whether to call for direct artillery gunfire, or to order your planes into the air. You will constantly be watching for an enemy airdrop, always carefully maneuvering your forces.

The stark reality of World War II comes alive in Battleground.

Order No. 0141R \$9.95

TO ORDER: Look for these programs at the dealer nearest you (see list of dealers on page 199). If your store doesn't stock Instant Software send your order with payment to:

Instant Software

Order Dept,

Peterborough, N.H. 03458

(Add \$1.00 for handling) or call toll-free 1-800-258-5473 (VISA, MC and AMEX accepted).

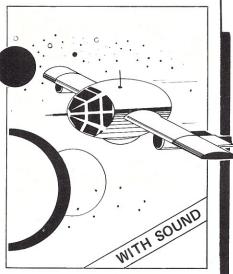


#### **Cosmic Patrol**

WARNING: PLAYERS OF THIS GAME SHOULD BE PREPARED FOR A STATE OF REALISM HITHERTO UNAVAILABLE ON THE TRS-80

The Cosmic Patrol program puts you in the command chair of a small interstellar patrol craft. Your mission is to defeat Terran space and prey on the Quelon supply ships which carry essential parts and lubrificants for that implacably hostile robotic force. The drone freighters are fairly easy pickings for the accomplished starship pilot, but beware of the I-Fighter escorts. They're armed, fast and piloted by intelligent robots linked to battle computers. They never miss.

The Cosmic Patrol program is not just another search and destroy game. With its fast, real-time action, impressive sound option and superb graphics, this machine-language program is the best of its genre.



Don't keep putting quarter after quarter into arcade games or spending big bucks for video games cartridges. Get Cosmic Patrol from Instant Software—and get the best for less! Order No. 0223R \$14.95



Prices subject to change without notice.

PETERBOROUGH, N.H. 03458 603-924-7296

### Ask for Instant Software at a computer store near you.

Anderson Computers 3156 University Dr., Huntsville Computerland of Huntsville 3020 University Dr., Huntsville Olensky Bros. 3763 Airport Blvd., Mobile

#### Arizona

Professional Data Systems 4506-A N. 16th St., Phoenix Millets TV & Radio

#### California

AMCO Elect. Supply 635 E. Arrow Hwy., Azusa Byte Shop 8038 Clairmont Mesa Blvd., San Diego Byte Shop 123 E. Yorba Linda, Placentia

Byte Shop of Mt. View 1415 West El Camino Real, Mt. View Byte Shop of Sacramento 6041 Greenback Ln., Citrus Heights Capital Computer Systems 3396 El Camino Ave., Sacramento Computers Made Easy 819 East Ave. Q-9, Palmdale

Computer Store of San Leandro 701 MacArthur Blvd., San Leandro Computer World 6791 Westminster Ave., Westminster Computerland 16720 S. Hawthorne, Lawndale

Computerland of W. LA 6840 La Cienega Blvd., Inglewood Coast Electronics 3118 No. Main St., Morro Bay Computerland 24001 via Fabricante No 904, Mission Viejo

Computer Mart of California 315 Diamond Bar Blvd., Diamond Bar

Electronic Systems 4883 Tonino, San Jose Hobbi-tronics 1378 So. Bascom Ave., San Jose Hobby World 19511 Business Ctr. Dr., Unit 6, Borthridge Huntington Computing 2020 Charles St., Corcoran

I.C.E. House Inc. 398 North E. St., San Bernardino Jade Computer Products 4901 W. Rosecrans, Hawthorne

Malibu Microcomputing 23910A Deville Way, Malibu Marfam Co. 6351 Almaden Rd., San Jose Opamp/Technical Books 1033 N. Sycamore Ave., Los Angeles

PC Computers 10166 San Pablo Ave., El Cerrito Q.I. Computers, Inc. 15818 Hawthorne Blvd., Lawndale Radio Shack Dealer 8250 Mira Mesa Blvd., San Diego

8250 Mira Mesa Divo., San Diego Radio Shack Dealer 50 N. Cabrillo Hwy., Half Moon Bay Santa Rosa Computer Center 604 7th St., Santa Rosa

Silver Spur Elect. Comm 13552 Central Ave., Chin The Computer Store 820 Broadway, Santa Monica

Colorado

Colorado Computer Systems 311 W. 74th Ave., Westminste Computerland of North Denver 8749 Wadsworth Blvd., Arvada Software Gourmet 1111 S. Pearl St., Denver The Computer Store 2300 Welton St., Denver

Connecticut

American Business Computers 454 Thames St., Groton Computerlab 130 Jefferson, New London Computerland 1700 Post Rd., Fairfield Computerland 60 Skiff St., Hamden Computer Works 1439 Post Rd. E., Liberty Plaza, Westport Instructional Systems Computers 807 Hartford Rd., Manchester Technology Systems 208 Greenwood Ave., Bethel

The Program Store 4200 Wisconsin Ave., N.W., Washington, D.C. Florida

Al Personal Computer 178 Oxford Rd., Fern Park AMF Electronics 11146 N. 30th St., Tampa

Boyd-Ebert Corporation 1328 West 15th St., Panama City Computer Center 6578 Central Ave., St. Petersburg Computer Junction 5450 So. State Rd. 7, Ft. Lauderdale

Computerland 7374 S. Tamiami Trail, Sarasota Computerland of Ft. Lauderdale 3963 N. Federal Hwy., Ft. Lauderdale Computerland of Jacksonville 2777-6 University Blvd. W. Jacksonville

Computerland of Tampa 1520 E. Fowler Ave., Tampa Computerland of West Palm Beach 4275 Okeechobee Blvd., West Palm Beach Computer Shack 3336 Beach Blvd., Jacksonville

Computer System Resources Inc. 3222 S.W. 35th Blvd., Gainesville Curtis Waters Enterprises 236 Talbot Ave., Melbourne Heath Kit Electronic 4705 W. 16th Ave. Center, Hialeah

HIS Computermation 1295 Cypress Ave., Melbou Ukatan Computer Store Airport Rd., Destin Williams Radio & TV Inc. 2062 Liberty St., Jacksonville Your Basic Computer Store 971 Seaway Dr., Ft. Pierce

Georgia Atlanta Comp Atlanta

Computerland of Atlanta 2423 Cobb Parkway, Smyrna Micro Computer Systems 3104 E. Shadowlawn N.E., Atlanta

Hawaii Computerland of Hawaii 567 N. Federal Hwy., Honolulu Radio Shack Assoc. Store 1712 S. King St., Honolulu

Idaho

Electronic Specialists 8411 Fairview Ave., Boise

Illinois

Computerland 4507 North Sterling, Peoria Computerland 9511 N. Milwaukee Ave., Niles

Computer Station 3659 Nameoki Rd., Granite City 3659 Nameon 100, Garcia & Associates 203 No. Wabash Ave., Suite 1510, Chicago

Midwest Micro Computers, Inc. 708 S. Main St., Lombard

Indiana

Data Domain 221 W. Dodds, Bloomington

lowa

Memory Bank 1721 Grant St., Bettenborf

Kansas

Central Kansas Computers 6 S. Broadway, Herington

Maine

Maine Computronics Intown Plaza, Bango Mid Maine Computer Co. 158 Turner St., Auburn Radio Shack 315 Main Mall Rd., So. Portland

Maryland

Computer Age 9433 Georgia Ave., Silver Springs Jack Fives Electronics 4608 Debilen Circle, Pikesville The Comm Center 9624 Ft. Meade Rd., Laurei

Massachusetts

ComputerCity 175 Main St., Charlestown ComputerCity 50 Worcester Rd., Framingham Computerland of Boston 214 Worcester Rd., Wellesley Computer Packages Unlimited 342 Boston Turnpike, Shrewsbury Land of Electronics 1127 Western Ave., Lynn Lighthouse Computer Software 14 Fall River Ave., Rehobath Mark Gordon Computers 15 Kenwood St., Cambridge

New England Electronics Co. 679 Highland Ave., Needham Small Business System Group Main St., Dunstable

The Computer Store 120 Cambridge St., Burlington Tufts Radio & Electronics 206 Mystic Ave., Medford Michigan

Computer Connections 38437 Grand River, Farmington Hills Computerland of Grand Rapids 2927 28th St. S.E., Kentwood Computerland of Southfield 29673 Northwestern Hwy., Southfield

Computer Mart 560 W. 14 Mile Rd., Clawson Computer Room 455 E. Michigan Ave., Kalamazoo Computronix Corp. 423 S. Saginaw Rd., Midland

Hobby House 1035 W. Territorial Rd., Battle Creek Main Systems Inc. 1161 No. Ballenger Hwy., Flint The Alternate Source 1806 Ada, Lansing

The Eight Bit Corner 722 Evanston Ave., Muskegon TRI Country Electronics & Sound Center 1537 North Leroy, Fenton

Ye Olde Teacher Shoppe 1823 Witmyre St., Ypsilanti Minnesota

Computerland of Hopkins 11319 Hwy F., Hopkins Digital Den Burnsville Center Minnesota Software Inc. 5422 Fisher St., White Bear Lake Zim Computers 5717 Xerxes Ave., N. Brooklin Center Mississippi

Dyer's, Inc. 200 E. Main St., West Point Softwarehouse 816 Foley St., Jackson W. Vernon Foster Inc. 816 Foley St., Jackson

Missouri

Century Next Computers 1001 E. Walnut, Columbia Comp-U-Trs Software Center 51 Florissant Oaks Shopping Center, Florissant Software Shack 16501 Greenwald Court, Belton

Montana

Intermountain Computer 529 So. 9th St., Livingston Personal Computer 121 Red Oak Dr., Carl Junction The Computer Store 1216 16th St. W. #35, Billings

Nebraska

Midwest Computer Co. Inc. 8625 I St., Omaha Midwest Computer Co. Inc. 4442 S. 84th St., Omaha Midwest Computer Co. Inc. 4403 S. 87th St., Omaha Scottsbluff Typewriters Inc. 1824 Broadway, Scottsbluff

Nevada

Century 23 4566 Spring Mountain Rd., Las Vegas

New Hampshire Bitsnbytes Computer Center 568 Pleasant St., Concord ComputerCity 1525 S. Willow, Manchester

Paul's TV Main St., Fremont Portsmouth Computer Center 31 Raynes Ave., Portsmouth

Radio Shack Assoc. Store Fairbanks Plaza, Keene Sturdivant and Dunn 124 Washington St., Conway

**New Jersey** Abe's TV Sales & Service College Town Shopping Center, Glassboro

Computer Corner of NJ 439 Rte. #23, Pompton Plains Computer Encounter 2 Nassau St., Princeton Computerland 35 Plaza Rte. #4, W. Paramus Computer Mart of NJ 501 Rte. 27, Iselin Crowley's Rd. #3, Whitehouse Station Dave's Electronics
Pennsville Shopping Ctr., Pennsville

GHB Enterprises Inc. Rte. 38, Rudderaw Ave., Mapleshade Lashen Electronics Inc. 21 Broadway, Denville 21 Broadway, Denville
Personal Computing Inc.
51 Central Sq., Linwood
Radio Shack/J&J Electronic
Mansfield Shopping Ctr.
Rt. 57 Allen Rd., Hackettstown The Bargain Brothers Glen Roc Shopping Center 216 Scotch Road, Trenton

216 Scotch Hoad, Trenton The Computer Emporium Bldg. 103, Avenues of Com 2428 Rte. 38, Cherry Hill **New Mexico** 

Autel Electronics Co. 232 Wisconsin N.E., Albuquerque South West Computer Center 121 Wyatt Drive, Suite 7, Las Cruces

Thomas E. Carr Jeweler 1300A Tenth St., Alamogordo

New York

Aristo Craft 314 Fifth Ave., NYC Berliner Computer Center 102 Jericho Turnpk, New Hyde Park Bits & Bytes 2800 Straight Rd., Fredonia

Computer Corner 200 Hamilton Ave., White Plains Computer Era Corp. 1570 3rd Ave., New York Computer Factory 485 Lexington Ave., NYC Computer House, Inc. 721 Atlantic Ave., Rochester

Computerland of Nassau 79 Westbury Ave., Carle Place Computerland of New York City 58 W. 44th St., New York Computer World 519 Boston Post Rd., Port Chester Comtek Electronics, Inc. 2666 Coney Island Ave., Brooklyn

Digibyte Systems Corp. 31E. 31st St., New York 80-Microcomputer Services 118 Masten Ave., Cohoes

Home Computer Center 671 Monroe Ave., Rochester Mr. Computer Imp. Plaza, Rte. 9, Wappingers Falls

Softron Systems 308 Columbia Turnpike, Rensselaei The Computer Tree Inc. 409 Hooper Rd., Endwell

Upstate Computer Shop 629 French Rd., Campus Plaza, New Hartford

North Carolina

Byte Shop of Raleigh 1213 Hillsborough St., Raleigh Sound Mill Slocum Shopping Ctr., Havelock

Ohio

Astro Video Electronics 504 E. Main St., Lancaster Cincinnati Computer Store 4816 Interstate Dr., Cincinnati Computerland 4579 Great Northern Blvd., N. Olmstead Computerland 6429 Busch Blvd., Columbus Computerland 1288 Som Rd., Mayfield Heights Computer Store of Toledo 18 Hillwyck Dr., Toledo Forbees Microsystems Inc. 35 N. Broad, Fairborn Microcomputer Center 7900 Paragon Rd., Dayton Micro-Mini Computer World 74 Robinwood, Columbus 21st Century Shop 16 Convention Way, Cincinnati Universal Amateur Radio, Inc. 1280 Aida Dr., Columbus

Oklahoma

Sounds, Etc. Hyw. 33, Watonga Vern Street Products 114 W. Taft St., Sapulpa

Computerland of Portland 12020 S.W. Main St., Tigard Computer Pathways Unlimited, Inc. 2151 Davcor St. S.E., Salem

TRS-80 Products Ltd. 3520 S.E. Vineyard Rd., Portland Pennsylvania

Artco Elect. 302 Wyoming Ave., Kingston Artco Elect.
Back Mountain Shopping Center, Shavertown Audio Mart
518 Fifth Ave., New Brighton Computer Workshoppe 3848 William Penn Hwy, Monroeville Computerland of Harrisburg 4644 Carlisle Pike, Mechanicsburg Computerland of Pittsburgh 5499 William Flynn Hwy., Gibsonia Erie Computer Co. 2127 West 8th St., Erie Mighty Byte Computer Center 537 Easton Rd., Horsham

Personal Computer Corp. Frazer Mall, Lancaster Ave., Frazer Rhode Island

Personal Computer Corp. 24-26 West Lancaster Ave., Paoli

Computer City 165 Angell St., Providence Digital World, Inc. 329 Bald Hill Rd., Warwick

South Dakota

CB Radio Shack 21st and Broadway, Yankton

Tennessee

ACS 1100 8th Ave. So., Nashville

Computerlab 671 S. Menden Hall Rd., Memphis H & H Electronics Inc. 509 N. Jackson St., Tullahoma

Computer Port 2142 N. Collins, Arlington Houston Computer Tech 5313 Bissonet, Bellarie

Interactive Computer 7620 Dashwood, Houston K.A. Elect. 9090 Stemmons Frwy., Dallas Pan American Elect. Inc. 1117 Conway, Mission Radio Shack Dealer 21969 Katy Freeway, Katy

The Compute Shop 6353 Camp Bowie Blvd., Ft. Worth Waghalter Books Inc. 3 Greenway Plaza E., Houston

Iltah

Quality Technology 470 E. 2nd So., Salt Lake City

Virginia

Computer Works Rte. 6, Box 65A, Harrisonburg Home Computer Center 2927 Virginia Beach Blvd. Virginia Beach

Southside Radio Comm. 135 Pickwick Ave., Colonial Heights

Washington

American Mercantile Co. Inc. 2418 1st Ave. S., Seattle Byte Shop of Bellevue 14701 N.E. 20th St., Bellevue Computer Connection Inc. 3100 NW Bucklin Hill Rd., Silverdale Computerland of South King Co. 1500 S. 336 St., Suite 12, Federal Way Personal Computers S 104 Freva, Spokane Ye Old Computer Shop 1301 G. Washington, Richland

West Virginia

The Computer Corner Inc. 22 Beechurst Ave., Morgantown The Computer Store Municipal Parking Bldg., Charleston

Wisconsin

Byte Shop Of Milwaukee 6019 West Layton Ave., Greenfield Computerland 690 S. Whitney Way, Madison Computerworld 3015 W. Wisconsin Ave., Appleton Magic Lantern Computed 3313 University Ave., Madison Petted Microsystems 4265 W. Loomis Rd., Milwaukee

Wyoming

Computer Concepts 1104 Logan Ave., Cheyenne Puerto Rico

The Microcomputer Store 1568 Ave. Jesus T. Pinero Caparra Terrace

CANADIAN DISTRIBUTORS Micron Distributing 409 Queen St., W. Toronto, Ont. M5V 2A5

# Instant Software

PETERBOROUGH, NEW HAMPSHIRE 03458

# Video HARDCOPY For CP/M

#### These machine-language programs give you printing power at the touch of a key.

```
CC00 =
                     SCRN
                                FOII
                                           OCCOOH ; VIDEO SCREEN ADDRESS
0100
0100 C5
                                 DRG 100H
                                PUSH B ; SAVE REGS
 0101 E5
                                PUSH H
0102 2100CC
0105 7E
0106 FE20
                                                      ;SCREEN ADDRESS
;LOOK FOR FIRST
                                           A,H
                                                      :NON-BLANK LINE.
 0108 C20F01
                                           UP2
010B 23
010C C30501
010F 7D
                     VP2:
                                YOM
                                           A,L
11000000B
0110 E6C0
0112 6F
0113 7B
                                                                 ;SET TO LINE BEGINNING
                     VP3:
                                HOV
                                                                 :PRINT REST OF SCREEN
0114 E63F
0116 C22F01
0119 CD4101
                                           00111111B
                                                                 :CHECK END OF LINE
                                           CRLF
                                CALL
011C E5
011D 7E
                                                                 :CHECK FOR REST OF
                                           VP7
0120 C22E01
                                JNZ
INX
0123 23
0124 7C
0125 FEB0
                               HOV
                                                      ; END OF SCREEN?
0127 C21D01
                                           VP6
                                                      :NOT YET.
                                                      ;RESTORE HL REGISTERS
;RETURN TO CP/H. NO MORE TO PRINT
;RESTORE HL REGISTERS
012A E1
012B C33D01
                                           VP8
012E E1
                                POP
012F 4E
0130 CD4C01
0133 23
                               HOV
CALL
INX
                                          C,M
PRINTER
0134 7C
                                           A.H
0135 FED0
                                JNZ
013A CD4101
                                CALL
                                           CRLF
013D E1
013E C1
013F C7
                     UPR:
                                                      :RESTORE REGS
                                RST
                                                      :RETURN TO CP/M
0140 C9
0141 0E0D
0143 CD4C01
                               RET
MVI
CALL
                                                                 ;CR
                                           PRINTER
                               HVI
0146 0E0A
                                                                 ;LF
014B C9
                               RET
014C 3AOAFE
014F E601
                    PRINTER:
                                                      OFEOOH+OAH
0151 CA4C01
0154 79
                                                      PRINTER
                                           JZ
0155 3202FE
0158 C9
0159
                Listing 1. Video HARDCOPY routine.
```

Glenn Stok PO Box 501 Woodside NY 11377

ow often have you wanted to keep a screen of information permanently? This desire has occurred to me many times. So I decided to add a hard-copy feature to my CP/M system.

In this article I will explain the method, show you the source listing and explain how to incorporate it into your CP/M system or your monitor. The only hardware requirement is that you have a memory-mapped video display and a printer. If you don't have CP/M, you can still use my HARDCOPY routine by making it part of your monitor (see Listing 1).

If you have a Z-80 CPU, you may find Listing 2 helpful. It is the same HARDCOPY routine written in Z-80 code. I have restricted this to relative addressing so it is relocatable. All you have to do is patch the machine code of Listing 2 anywhere in your monitor and patch branches

to and from it for I/O. The CALL to your PRINT routine has to be patched in three places. Make sure that you correct the address in the CALL CRLF instructions (the Z-80 does not have relative addressable CALL instructions). Listing 1 is entirely in 8080 code, so it will run on either CPU.

#### **Adding Hard Copy**

We don't want the request for a hard copy to change the screen. Since we want to copy the screen, a command that echoes to the screen will be messy. We also want to have the option of making a hard copy even when running another program. As long as it looks at the keyboard once in a while, this can be done. This is feasible if all I/O goes through CP/M or your monitor. In this case, we are only concerned about I/O with the keyboard.

With this situation we can have the "keyboard read" routine check for a control key. If it is not the proper key, then process normally. If it is the key that

we have chosen for a hard-copy request, then the logic will branch to the HARDCOPY routine before returning to the calling program.

If you have CP/M and understand the workings of your CBIOS (the Basic I/O Section, Converted for your system), you may be saying, "But I don't have enough room at the top to add a routine to my CBIOS!"

Well, yes you do! And here is how to get more room: Move the entire CP/M system down one kilobyte with your MOVCPM command.

For instance, say you have 24K. Use EDIT to change the EQU for system size in both your CBIOS and your boot loader to 23K. After you add the HARD-COPY routine to your CBIOS, assemble both the boot loader and the CBIOS. Then follow your normal procedures with your MOV-CPM command and SYSGEN to create a new version for 23K with hard-copy capabilities.

If you only have a 16K system, you can't SYSGEN a 15K system because 16K is the minimum for CP/M. But try assembling your CBIOS at 16K with the HARD-COPY routine in it. Maybe you will not go beyond your available RAM (i.e., address 3FFF). If you are close, then maybe you can cut some bytes by changing some logic of other parts of your CBIOS.

#### Source Listing

The source listing of Listing 3

#### Listing 3. CBIOS source listing. 0017 = MSIZE ;SIZE OF OPERATING SYSTEM IN KILOBYTES F800 = CONTROLLER EQU 0F800H CONTROLLER+400H FC00 = BUFF EQU MSIZE\*1024-512 ; ORG LOCATION FOR THE CBIOS 5A00 = LOCATION EQU ; BASE OF BIOS IN 23K SYSTEM LOCATION 5A00 DRG ; IOBYTE FOR I/O CONTROL 0003 = IOBYTE EQU < SECTION NOT SHOWN > 1000 = CBASE EQU (MSIZE-16)\*1024 ; BIAS FOR SYSTEMS GREATER THAN 16K 4500 == CBASE+2900H 4D06 = BDDS CBASE+3106H EQU 4480 = CCPM EQU CP HB-128 CPML \$-CPHB 1500 = EQU ; 5400 C3125B INP COLDROOT EBGOT: 5A03 C3B95A JMP WBOOT CONSTAT 5A06 C3555B 5A09 C3625B JMP CONIN CONOUT 5A0C C3725C JHP 5AOF C37B5B JMP LIST 5A12 C3835B JMP PRINTER 5A15 C3955B JMP READER 5A18 C32D5A JMP HOME 1 : HOME 5A1B C3335A JMP TEMPSELDSK ; SEL DSK 5A1E C3515A JMP SETTRK1 ;SETTRK JMP JMP 5A21 C30CF8 SETSEC :SETSEC 5A24 C30FF8 SETDMA :SETDMA JMP ;DISKREAD 5A27 C3985B READ 5A2A C3B75B WRITE :DISKURITE < SECTION NOT SHOWN > :DO THIS ONLY ON COLD START COLDBOOT: 5B12 3E09 A.00001001B IVM ; ASSIGN INITIAL I/O 5B14 320300 STA IOBYTE 5817 AF XRA 5B18 D3C8 0C8H :INIT. SCREEN TUO CLRCRY ; CLEAR THE SCREEN 5B1A CDAA5C CALL 5B1D 21115D H,SIGNON PRINT SIGNON MESSAGE 5820 CD185C CALL PRHSG BOOT: < SECTION NOT SHOWN > 5852 C30045 JNP CPMB CONIN ROUTINE CHECKS FOR FUNCTION KEYS IF NOT A FUNCTION, THEN IT RETURNS THE KEY IN REGISTER 'A'. 5B62 CD555B CONIN: CALL CONSTAT 5865 CA625B JZ CONIN LDA WRCONT+2 5868 3A02FE

L	isting 2. I	HARDO	COPY routine in Z-80 code.	0125 0126	E1 180E		POP JMPR	H VP8	;RESTORE HL REGISTERS ;RETURN TO CP/N.
				4400					; NO MORE TO PRINT
		;	ADDRESSED AT HEX 100 FOR STAND ALONE	0128	E1	VP7:	POP	H	;RESTORE HL REGISTERS
		;	TEST UNDER CP/M.	0129	4E	VP4:	HOV	C, M	
25.55		·		012A	CD 0145		CALL	PRINT	
CC00		SCRN	= OCCOOH ; VIDEO SCREEN ADDRESS	012B	23		INX	Н	
			.PABS ; CREATE INTEL HEX FILE	012E	70		HOV	A,H	
0100			.LOC 100H	012F	FED0		CPI	овон	
0100	C5		PUSH B ; SAVE REGS	0131	20DE		JRNZ	VP3	
0101	E5		PUSH H	0133	CD 013A		CALL	CRLF	
0102	21 CC00		LXI H,SCRN ;SCREEN ADDRESS	0136	E1	VP8:	POP	Н	RESTORE REGS
0105	7E	VP1:	HOV A,H ;LOOK FOR FIRST	0137	C1		POP	В	
0106	FE20		CPI '' ;NON-BLANK LINE.	0138	C7		RST	0	;RETURN TO CP/M
0108	2003		JRNZ VP2	0139	C9	5 2003473	RET		
010A	23		INX H	013A	OEOD	CRLF:	HVI	C,ODH	;CR
010B	18F8		JMPR VP1 .	0130	CD 0145		CALL	PRINT	
010D	7 D	VP2:	HOV A,L	013F	OEOA		IVH	C,OAH	;LF
010E	E6C0		ANI 11000000B ; SET TO LINE BEGIN	0141	CD 0145		CALL	PRINT	
0110	6F		HOV L,A	0145	3A FEOA	PRINT:	LDA	OFEOOH-	+OAH
0111	7 D	VP3:	MOV A,L ;PRINT REST OF SCREEN	0148	E601			ANI	01
0112	E63F		ANI 00111111B ; CHECK END OF LINE	014A	28F9			JRZ	PRINT
0114	2013		JRNZ VP4	014C	79			HOV	A,C
0116	CD 013A		CALL CRLF	014D	32 FE02			STA	OFEOOH+2
0119	E5	VP5:	PUSH H ; CHECK FOR REST OF	0150	C9			RET	
011A	7E	VP6:	HOV A.H ;SCREEN BLANK				.END		
011B	FE20		CPI						
011D	2009		JRNZ VP7	CRLF	013A	PRINT	0145	SCR	N CCOO
011F	23		INX H	VP1	0105	VP2	010D	VP3	0111
0120	70		NOV A,H	VP4	0129	VP5	0119	VP6	011A
0121	FEDO		CPI ODOH ; END OF SCREEN?	VP7	0128	VP8	0136	.BLN	NK. 0000:03 X
0123	20F5		JRNZ VP6 :NOT YET.	.DATA	. 0000* X	.PROG.	0000	X	

586B E67F

Program continues.

```
Listing 3 continued.
                5B6D FE60
                                                  CPI
                                                                   :TAB KEY
                                                          MAYBHARD
                     C2755B
                                                  JNZ
                5B6F
                5B72 3E09
                                                  HVI
                                                                   : TAB CODE
                5874 C9
                                                  RET
                                                                   ; HARD COPY KEY
               5B75 FE7E
                                MAYBHARD:
                                                          7EH
                                                  CPI
               5B77 CO
                                                  RNZ
                5878 C3255C
                                                          HARDCOPY
                                                                            ;GO DO HARDCOPY
                                                  JMP
                                                                            ;THEN GET THE CONSOLE KEY.
                                                          IOBYTE
               5 B 7 B 3 A 0 3 0 0
                                LIST:
                                                  LDA
                                                          01000000B
                                                                            CHECK ASSIGNMENT
               5B7F F640
                                                  ANI
               5880 C27A5C
                                                  JNZ
                                                  LDA
                                                          WRCONT+OAH
                5B83 3AOAFE
                                PRINTER:
                                                  ANT
                5886 E601
                                                          PRINTER
               5888 CA8358
                                                  JZ
                                                  MOV
                                                          A.C
               5B8B 79
               5B8C FE5C
                                                  CPI
                                                                    :HOLD PRINTER?
                                                                   CONIN WILL RELEASE ON ANY KEY
                5B8E CA625B
                                                  JΖ
                                                          CONTN
                                                          WRCONT+2
               5891 3202FF
                                                  STA
               5B94 C9
                                                  RET
                                                          A, IAH
                5B95 3E1A
                                READER:
                                                  MVI
                                                                   :FORCE EOF FOR DUMMY READER
                                                  RET
               5B97 C9
                                         SECTION NOT SHOWN
                                PRMSG:
                                         ;PRINT MESSAGE AT H,L TILL '0'
               5018 ZE
                                         VOM
                                                  A.M
               5019 B7
                                         ORA
                                                          : MORE TO PRINT
               501B E5
                                         PUSH
                                                 Н
                                                 C,A
               5C1C 4F
                                         VOM
                                         CALL
                                                  CONOUT
               501D CD7250
                5C20 E1
                                         POP
               5021 23
                                         INX
               5C22 C3185C
                                         JMP
                                                  PRMSG
                                         VIDEO HARD COPY ROUTINE
                                         URITTEN BY GLENN STOK
               CC00 =
                                SCRN
                                                          ; VIDEO SCREEN ADDRESS
                5C25 C5
                                HARDCOPY: PUSH B
                                                           :SAVE REGS
               5026 E5
5027 210000
                                         PUSH
                                                                    ;SCREEN ADDRESS
                                         LXI
                                                  H.SCRN
               5C2A 7E
                                UP1:
                                                           :LOOK FOR FIRST
                                         HOV
               502B FF20
                                         CPT
                                                          :NON-BLANK LINE.
                                                  VP2
               5C2D C2345C
                                         JNZ
                5030 23
                5C31 C32A5C
                                         IMP
                                                  UP1
               5034 7D
                                VP2:
                                         VOM
                                                  A.L
                                                                    ; SET TO LINE BEGINNING
               5035 E800
                                         INA
                5C37 6F
                                                                    :PRINT REST OF SCREEN
               5038 7D
                                VP3:
                                         MOU
                                                  00111111B
                                                                   CHECK END OF LINE
               5039 E63F
                                         ANI
               5C3B C2545C
                                         JNZ
                5C3E CD675C
                                                  CRLF
                                                                    :CHECK FOR REST OF
                5C41 E5
                                UP5.
                                         PHISH
                                                  A.M
                                                                    :SCREEN BLANK
               5C42 7E
                                VP6:
                                         VOM
               5C43 FE20
                                         CPI
                                                  UP7
                5C45 C2535C
                                         JNZ
               5C48 23
                                         TNY
                                                 A.H
                5049 70
                                         MOV
                5C4A FEDO
                                         CPI
                                                          ; END OF SCREEN?
                                                 VP6
                                         JNZ
                                                           :NOT YET.
               5C4C C2425C
                                                           :RESTORE HL REGISTERS
               5C4F F1
                                         POP
                                                  VP8
                                                           RETURN. NO MORE TO PRINT
               5C50 C3625C
                                         JMP
                5C53 E1
                                                           RESTORE NEXT LINE TO FRINT
                                         POP
               5C54 4E
                                VP4:
                                         MNU
                                                  C. N
               5C55 CD835B
                                                  PRINTER
                                         CALL
               5C58 23
                                         INX
                5C59 70
                                         VOM
               5C5A FEDO
                                         CPI
                                                  ODOH
               5C5C C2385C
                                         JNZ
                                                  VP3
               505F CD6750
                                         CALL
                                                 CRLF
                                                          :RESTORE REGS
               5C62 E1
                                VP8:
               5C63 C1
                                         POP
                                                          :NOW GO GET CHARACTER.
               5C64 C3625B
                                         JMP
                                                 CONIN
               5C67 0E0D
                                CRLF
                                                  C,ODH
                                                                   :CR
                                         IVM
                                                  PRINTER
               5C69 CD835B
               5C6C OEOA
                                         MVI
                                                  C.OAH
                                                                   :LF
               SCAF CD835B
                                         CALL
                                                  PRINTER
               5C71 C9
                                         RET
                                   VIDEO CONTROL FOR CRT - ROUTINE FOR CP/M BIOS MODULE
                                   WRITTEN BY GLENN STOK, STOK COMPUTER INTERFACE
                                                           :REL. CURSOR LOC. STORAGE
               004E =
                                CURS
               00D0 =
                                SEND
                                         EQU
                                                  орон
                                                           ; END OF SCREEN PAGE.
                                                           : I INF LENGTH
               0040 =
                                ITHE
                                         FRII
                                                 20H
                                                          ; BLANK
                                BLANK
                                        EQU
               0020 =
               5C72 3A0300
                                CONOUT: LDA
                                                  TORYTE
                                                                   ; CHECK I/O ASSIGNMENT
                                                  00000001B
                                        ANI
               5C75 E601
               5C77 CA835B
                                                 PRINTER
                                         JZ
                                                                                                      Program continues.
```

is my CBIOS. Study the CONIN routine, which reads the keyboard and checks for function keys. Note that I wrote the routine to look for a tilde (~) key. This is hex 7E. You can choose another, but make sure you will never need it for anything else. This key becomes a "function key." Maybe your keyboard has function keys that you can use.

#### Implementation

Now look at the HARDCOPY routine in my CBIOS. Note the EQU for the screen address of my memory-mapped VDM. Replace this with the proper address for your system.

Most memory-mapped video has 16 lines and 64 characters per line. This is because this size conveniently uses a 1K block of memory (16 times 64 is 1024, or 1K). If your video is not 16 by 64, then this will considerably change the logic I have used in the routine. But maybe you would like to play with it.

Anyway, if you have a 16 by 64 display, let's continue. Insert the code of Listing 1 or 2 into your CBIOS and put the FUNCTION KEY check in your present "keyboard read" routine. Jump to the HARDCOPY routine if the key matches. Correct the call to the PRINTER routine in Listing 1 or 2. You should call your PRINTER routine in your CBIOS.

The HARDCOPY routine saves and restores all affected registers so as not to interfere with any running programs. It will start its transfer to the print device at the beginning of the first non-blank line. It will print up to and including the last non-blank line.

To do this I have it check if the rest of the screen is blank each time it starts a new line. Even though this is redundant, it does not slow down the printer because the printer, being mechanical, is even slower. The alternative is to search, once and for all, before the start and save the ending address to compare with. I decided against this so as not to create an extra burden for anyone who wants to put the routine in a PROM chip.

The ASCII codes recognized by video boards sometimes differ from the codes recognized

#### MODEL II



26-4002 64K 1 Drive \$3499.00

MODEL III



26-1061 4K I	. \$630.00
26-1062 16K III	900.00
26-1063 32K III	
2-Drives, RS232	. 2246.00



#### CENTRONICS

Fast 100 CPS Centronics	
730 Printer	\$675.00
Text Quality Centronics	
737 Printer	\$850.00

Model II Cobol Compiler \$360.00 Cobol Run Time Package \$36.00

## AUTHORIZED TRS-80®

#### COMPUTER SPECIALISTS

26-1056 16K Level II System with Keypad.	\$670.00
26-1145 RS-232 Board	84.00
26-1140 "O" K Interface	
26-1141 "16" K Interface	365.00
26-1142 "32" K Interface	
26-1160 Mini Disk - Drive O	424.00
26-1161 Mini Disk · Additional	424.00
26-1154 Lineprinter II	720.00
26-1156 Lineprinter III	
26-1180 Voice Synthesiser	
26-1181 VOXBOX	145.00
26-1104 Factory Upper/Lower	
Case Modification Installed	70.00
26-1506 Scripsit - Tape	60.00
26-1563 Scripsit - Disk	85.00

NOTE: Call for availability of VIDEO TEX, Model III, Color, and other new products.

> ALL OTHER R.S. SOFTWARE FURNITURE, STANDS, CABLES AND ACCESSORIES DEDUCT 10% FROM CATALOG PRICE

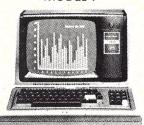
Novation Cat Modem\$149.0	00
CCA Data Management	
System72.0	00
Adventure Games	
Games 1-9 each14.0	00

**Pocket Computer** 

B: C: A= I (	B+B+C+C	885	545
			r. 1.
	-	000	nc
	0 (E) (E)		

26-3501	1.9K P.C								\$2	25.00
26-3503	Cassette I/F.									45.00
14-812 F	Recorder									72.00

MODEL I



26-1054 4K Level II \$552.00

COLOR



26-3001 4K		 	 	\$360.00
26-3002 16K		 	 	. 540.00
26-3010 Color	Video.	 	 	. 360.00
26-1206 Record	der	 	 	54.00
26-3008 Joystic	ks	 	 	22.50



GAMES:
Alien Invasion\$9.00
Stock Market9.00
Star Trek9.00
Block 'Em
Ting-Tong 9.00
UTILITIES:
System Savers14.00
EDUCATION:
Language Teacher 18.00

FREE: PRICE LIST **UPON REQUEST** 

# 1-800-841-0860 Toll Free Order Entry MICHO MANAGEMENT SYSTEMS, INC.

No Taxes on Out Of State Shipments

Immediate Shipment From Stock on Most Items

DOWNTOWN PLAZA SHOPPING CENTER 115 C SECOND AVE. S.W. CAIRO, GEORGIA 31728 (912) 377-7120 Ga. Phone No.

\*TRS-80 is a registered trademark of the Tandy Corp.

**Full Factory Warranty** on All Items Sold.

Largest Inventory In the S.E. U.S.A.

Listin	ng 3 contin	ued.			
5C7A	2A4E00	CRTOUT:	LHLD	CURS	
5 C 7 D	EB		XCHG		; PUT RELATIVE CURSOR IN D
5C7E	2100CC		LXI	H,SCRN	; PUT SCREEN ADDRESS IN HL
5081	19		DAD	B	GET ABSOLUTE CURSOR LOC.
5082	41		HOV	B,C	
5083	7E		MOV	A.M	
5C84	E67F		ANI	7FH	;TURN OFF CURSOR
5086	77		MOV	M.A	
5087	78		MOV	A.B	; CHECK FOR CONTROL CHARS.
5088	FEOC		CPI	OCH	;ERASE SCREEN
5C8A	CAAASC		JZ	CLRCRT	
	FE07		CPI	0.7	
-	CAA45C		JZ	RINGBEL	L
5092	FE08		CPI	08	:CTL H (BACK SPACE)
5C94	CABC5C		JZ	BS	
5097	FE0A		CPI	OAH	:LINE FEED
5099	CAC15C		JZ	LF	
5090	FEOD		CPI	ODH	CARRIAGE RETURN
5C9E	CAF35C		JZ	CR	· construction and a second
5CA1	C3FB5C		JMP	OTHER	:PUT OUT ANY OTHER CHAR. AS IS
5CA4	0E07	RINGBEL	L: MVI	C,07	
5CA6	CD835B		CALL	PRINTER	
5CA9	C9		RET		
5CAA	210000	CLRCRT	LXI	H, SCRN	CLEAR THE SCREEN
5CAD	3620	CLR	MVI	M, BLANK	;BLANK OUT THIS LOCATION.
5CAF	23		INX	Н	
5CB0	70		HOV	A,H	
5CB1	FEDO		CPI	SEND	;END OF SCREEN?
5CB3	C2AD5C		JNZ	CLR	
	210000		LXI	H,0	;HOME THE CURSOR.
	C3015D		JMP	PÚT	
	1 B	BS	DCX	D	
5 CBD			XCHG		
5 CBE	C3015D		JMP	PUT	
		;		11 1 7 7 7	
	214000	LF	LXI	H,LINE	
5CC4			DAD	D	; ADD LINE LENGTH TO REL. CURSO
	CDCB5C		CALL	SCROLL	;DO SCROLL IF END OF SCREEN
	C3015D		JMP	PUT	
5CCB		SCROLL	MOV	A,H	
5CCC	FE04		CPI	4	CHECK IF PAST THE SCREEN AREA

;DO NOTHING IF NOT

by printers. Most printers respond to true ASCII codes, but some video boards have graphics abilities. To tell printable characters from graphics, these boards may use the high-order bit (usually for parity) to trigger the graphics representation of a byte. To print a printable character, this bit may have to turn on or off. You could add an OI or ANI to OR or AND, respectively, each byte before calling your PRINTER routine.

Check if this is necessary in your case. VDM does not require this, but the Polymorphic video display may have to have the parity bit shut off (ANI 7FH) for some printers to recognize the byte as the proper character. As for graphics, you'll have to sub-

LL FROM THE TOP T HL TO SECOND LINE S OF LINE ABOVE. AR. THERE FINISHED?
T HL TO SECOND LINE S OF LINE ABOVE. AR. THERE
S OF LINE ABOVE. AR. THERE
AR. THERE
AR. THERE
AR. THERE
FINISHED?
FINISHED?
FINISHED?
FINISHELL
LAST LINE
EL. CURSOR
E LINE.
TO BEGINNING OF LINE.

#### **FEATURES INCLUDE:**

 Uses Standard Typewriter Ribbon (Model 101B-80)

PUSH

Built-In Power Supply

SCCE D8

- 5 x 7 Dot Matrix Character Generator or 10 x 7 or 10 x 14 Dot Matrix
- Standard 96 ASCII Character Font
- Upper and Lower Case Printing
- Up to 88 Characters Per Line
- Single Line Print Rate Is \*\*110/160 CPS
- Average Print Rate Is
  - \*\*55/60 CPS For Ten Lines
- Graphics Capability With Extended Character Modes
- Programmable With 32 System Level Software Commands
- Standard Parallel and Serial Interface
- Reset Interface
- Baudrate Select From 110 to 9600
- Manual Paper Advance (Model 101B-80)
- Manual Selftest
- Adjustable Tractor Width From 1 to 9½ Inches (Model 101B-80)
  - \*\*Model 101A-40 & 101B-80 Respectively

#### **80 COLUMN LOW COST IMPACT PRINTER**



\$495 Kit, 101B-80KE

\$545 Assembled & Tested 101B-80E

COOSOL, INC. P.O. BOX 743, ANAHEIM, CA 92805 (714) 545-2216 7 Days a Week

stitute nonprintable characters with a printable one. My VDM doesn't have graphics, so I had no need for this routine. Also note that if a blank is not represented by a hex 20 with your video board, then you'll have to correct the CPI ' ' instructions in listings 2 and 3.

I'll be glad to help with any questions, if you help me by including a stamped, addressed envelope.

Enjoy the new power you now have at the touch of a key. But be sure that there's paper in that printer!

7 EB				
		XCHG		
B C3015D		JMP	PUT	
	;			
B 70	OTHER	MOV	M,B	;DISPLAY CHAR.
C 13		INX	D	;INCR. CURSOR
D EB		XCHG		
E CDCB5C		CALL	SCROLL	;SCROLL IF NECESSARY
1 7C	PUT	MOV	A,H	; PUT CURSOR IN NEW LOCATION ON SCREEN
2 E603		ANI	3	; MAKE RELATIVE AGAIN
4 67		VOM	H,A	
5 224E00		SHLD	CURS	;UPDATE CURSOR
B 1100CC		LXI	D,SCRN	
B 19		DAD	D	
C 7E		MOV	A,M	;GET CHAR. UNDER CURSOR
D F680		ORI	80H	;SET CURSOR ON
F 77		MOV	M,A	
0 09		RET		
	;			
1 ODOAOAOA	SIGNON:	DB	OBH, OAH,	,OAH,OAH
5 202020202	0	DB	1	STOK CP/M SYSTEM - VERSION 5/10/79'
2 ODOA00		DB	ODH, OAH,	,0
5		END		
	B 70 C 13 D ER E CDCB5C 12 E 603 14 67 15 224E00 18 1100CC 18 19 10 C 7E D F680 F 77 0 C9 1 0D0A0A0A 5 202020202 2 0D0A00	B 70 OTHER C 13 D EB C DDCB5C T 7C PUT 12 E603 14 67 15 224E00 18 1100CC 18 1100CC 19 19 C 7E 10 F680 F 77 C C9 1 0D0A0A0A SIGNON: 5 2020202020 2 0D0A00	B 70 OTHER MOV C 13 INX C 15 EN XCH6 FE CDCB5C CALL 17 C PUT MOV 12 E603 ANI 16 67 HOV 15 224E00 SHLD 18 1100CC LXI 18 19 DAD 16 77 HOV 17 F680 ORI 18 77 HOV 19 F680 ORI 19 F77 HOV 10 C9 RET 1 ODOAOAOA SIGNON: DB 12 ODOAOO	B 70

#### NEW ...

#### S-100 A/D and TIMER BOARD

Tecmar's new A/D and Timer Board is designed to meet sophisticated data acquisition needs. The board can accommodate various A/D modules providing options such as 12, 14, or 16 bit accuracy; 100 MHz throughput; variable ranges and gains. It contains a powerful timer circuit (AMD 9513) which can start A/D conversion and can also be used independently for time of day, event counting, frequency shift keying and many other applications.

TRS-801 S-100

High Speed 8 Ch. Differential

16 Ch. Single-ended Each A/D Module \$495

12 Bit

PET2

KIM<sup>2</sup>

**APPLE** (available soon)

12 Bit High Speed Channel

Each D/A Module \$395

TRS-80 or PET expansion board, power supply, and enclosure \$200. Kim expansion board and power supply \$150.



TECMAR, INC. (216)382.7599

23414 Greenlawn • Cleveland, OH 44122

#### S-100 BOARDS

Real Time \$850 Video Digitizer & Display 8086 CPU \$450 W/vectored interrupts RAM \$395

8Kx16/16Kx8 8086 \$495

PROM-I/O Serial and \$350 Parallel I/O

Parallel I/O \$350 & Timer Complete Systems

Also available <sup>1</sup>Reg. Trademark of Tandy Corp. <sup>2</sup>Reg. Trademark of Commodore

Now the world's most popular microcomputer, with 16K of memory and Level II basic for only \$685, complete. We accept check, money order or phone orders with Visa or Master Charge. (Shipping costs added to charge orders).

Disk drives, printers, peripherals, software and games...you name it, we've got it (Both Radio Shack and other brands). Write or call for our complete price list.



**AUTHORIZED** 

32 E. Main Street ● Milan, Michigan 48160 ● (313) 439-1508

# Bridging the 1 pF To 100,000 uF Gap

Take the guesswork out of capacitor values with this inexpensive digital capacitance meter.

Robert J. Stetson Applications Engineer BASF Systems Crosby Dr. Bedford, MA 01730

efective capacitors can smoke expensive components in your projects and cause all kinds of general grief. Nothing makes our systems act more demon possessed than a problem capacitor deep in the bowels of an otherwise perfect machine. Before you call in the exorcist, build this digital capacitance meter and start verifying capacitors before they go into the system. Later, if they fail, you will have the means to root them out.

The digital capacitance meter is not only capable of verifying the quality of a known value of capacitor, but also can unmask that unmarked capacitor we've all been known to wonder about from time to time.

The limits of this unit span from 1 pF through 100,000 uF. Needless to say, it accommodates all of my needs. The cost is low, too, right around \$35. Considering all the unit can accomplish in the way of testing a long range of capacitance values, it's quite easy to use.

In the short time I've had my unit, all the capacitors in my parts cabinet have been tested, and the defective ones have been weeded out. Next, I plan to take advantage of some gigantic unmarked capacitor bonanzas.

#### **Operating the Digital** Capacitance Meter

The control panel layout is shown in Fig. 1. The toggle switch in the lower left-hand corner of the control panel selects between the high- and low-order group of ranges. With the group-select switch in the EH position, the range-control switch selects the group of ranges E-1 through E3. The switch in the EL position causes the range selector to operate from E-6 through E-2.

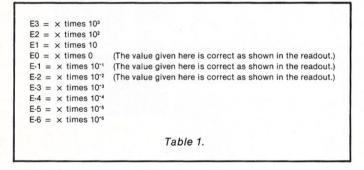
The ranges identified by the symbols E-6 through E3 are abbreviated expressions in scientific notation. The converted expressions are listed in Table 1. The decimal point is adjusted as directed by the expression, unless otherwise directed in parentheses.

The range E0 is correct as shown in the readout because it is given as the direct value of the capacitor in microfarads. This range covers the value of 1 uF through 99 uF. In the range E-1, the value is correct as shown in the readout because the internal logic places the decimal point for us, so that the readout reads "X.X". This range, then, covers the values 0.1 through 9.9 microfarads.

In the E-2 range, the decimal is also placed, so that the readout shows ".XX" uF. This is the range .01 uF through .99 uF. All of the other ranges require you to place the decimal according to the value of the exponent. The resulting value will always be in microfarads. For instance, 1 pF is equal to .000001 uF.

The power switch is optional and may be omitted if the unit is not going to be left plugged in when not in use. Upon application of power, the unit has a built-in power on reset. The unit should power on with the ready lamp illuminated and 00 in the readout.

The illuminated ready lamp indicates that the unit is ready to test a capacitor. Select the



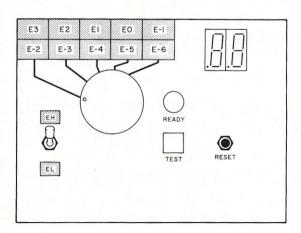


Fig. 1. Control panel layout.

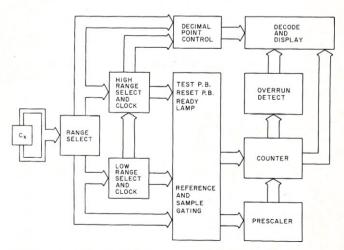


Fig. 2. Circuit operation.

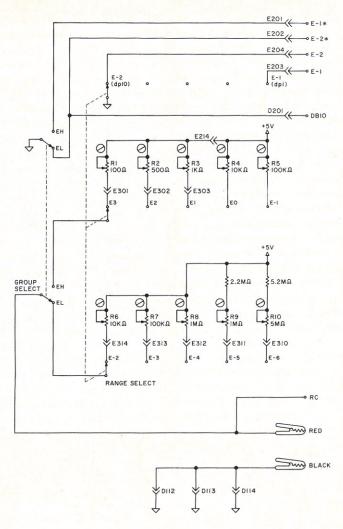


Fig. 3. Range control.

best range for the capacitor to be tested and connect the black clip to the negative lead (if it is an electrolytic) and the red clip to the positive lead. Press the test push button and the ready lamp goes out. Assuming that the capacitor is good and that the correct range was selected, a number appears in the readout. This, along with the exponential shift, is the value in uF.

If you select the correct range, but the value in the readout is much higher than that shown on the cap, it's leaky. Also, a leaky cap may cause the display to go into an overrange condition, causing the readout to flash on and off. If the cap is shorted, the readout will flash on and off and the counter will continue to count.

#### **Theory of Operation**

An overall view of the circuit operation is shown in Fig. 2.

The unit has two groups of ranges, each with its own clock. Each group, in turn, has five ranges.

In Fig. 3, the capacitor to be tested is connected with the positive end on the red clip and the negative end on the black clip. If the value of the capacitor is, say, .01 uF, the groupselect switch should be set on EL (Exponential Low range), and the range-select switch should be set to E-2. This setting on the group-select switch will cause the far left decimal to light, and the readout will show .00 when the unit is powered up.

In this situation, the groupselect switch (top section) pulls E-2\* to ground, and the rangeselect switch (top section) pulls E-2 to ground. The combination of E-2 and E-2\* in Fig. 4 causes dp2 to go low. The signal dp2 goes to Fig. 5, where the decimal point is lit.

The group-select switch also

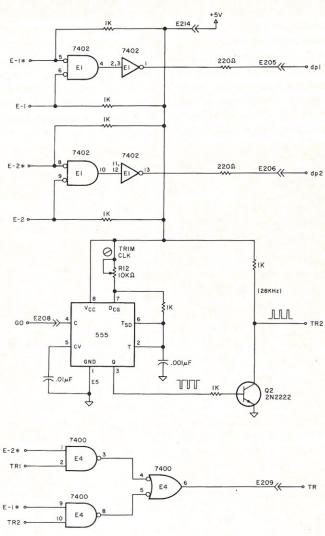


Fig. 4. Timing and control.

pulls DB10 to around in the EL position. DB10 goes to Fig. 6. where it presets the 7474 latch. With the latch preset, the Q output goes low and enables the 7402 NAND gate (C4) to pass the composite signal generated by combining TR and TX. As long as DB10 remains low, the number of pulses gated through the NAND gate will equal the number of pulses gated out of CNT. DB10 will remain low as long as the group-select switch is in the EL position.

In Fig. 3, the range-select switch completes a circuit from R6, through the group-select switch to the positive end of the capacitor, to RC, which goes to Fig. 7, where it becomes the timing network to pin 6 and 7 of the 555 timer. The A1 timer (555) is an astable timer, i.e., it fires only once each time it is triggered.

The power-on-reset circuit

consists of a 220 uF capacitor from the clear input to the 7474s in Fig. 7 to ground. If the poweron-reset feature is not desired, the 220 uF cap may be eliminated, but the 1k Ohm resistor to +5 volts will still be required as a pull-up. The duration of the reset pulse to the clear input on power up is determined by the RC time constant of the pull-up resistor and the reset capacitor combination. For 220 uF times 1k Ohms, this is .22 seconds.

When the unit powers up, the clear input to the 7474s goes high .22 seconds later than the preset input to ensure the power-up state of the unit. The first latch illuminates the ready lamp on the front panel, while the second latch resets GO and SEQ.

In Fig. 7, SEQ goes high and primes the trigger network to the 555 timer. In the low state, GO holds the other 555 timer reset on pin 4 of C1. In Fig. 4, the 555 timer (E5) is also held reset with GO being low on pin 4. In Fig. 6, SEQ being high ensures that the divider (or prescaler) is being held at a binary 0000. In Fig. 5, SEQ holds the display counter at decimal 00, as well as holding the 7474 overrun de-

tector in a reset condition.

The unit is now ready to provide an accurate test, and the two reference clocks are halted. The low-range reference clock is in Fig. 4 (E5), with the clear held low by GO. The clocks both have inverter-drivers at the outputs to flip the signal from

Fig. 5. Counter and output display.

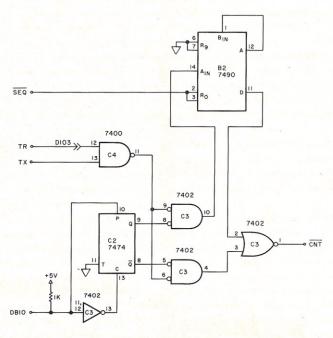


Fig. 6. Prescaler.

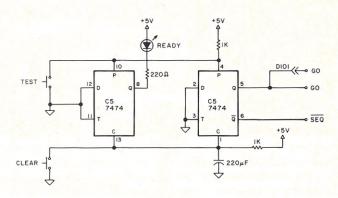
pin 3 of the 555s, so that the signal is normally low with positive-going spikes. Also, the use of transistor driver stages ensures constant loading on the output of the timers and prevents frequency shifts from occurring due to loading or noise coupling at the output.

The high-range reference clock is in Fig. 7 and has the same identical configuration. The only differences in the two clocks are the values placed on the timing components, which generate a low-group selected reference frequency of 28 kHz and a high-group selected reference frequency of 1.5 kHz.

To control the exact number of clock pulses occurring during the timing window, the two clocks are held in a reset state until you press the test button. If the reference clock were free running, the clock pulses would not be uniformly framed in the timing window generated by

TX, affecting the unit's accuracy. The unit would be unstable, and the reading would tend to vary from test to test with the same capacitor.

With the capacitor under test in place and the ready lamp lit, press the test push button. The two 7474s in Fig. 7 preset, and the ready lamp extinguishes. GO goes high and SEQ goes low, firing the 555 (A1) timer, which generates a single positive-going pulse whose duration is under the control of the capacitor under test and the resistor selected by the groupselect switch and the rangeselect switch combination. SEQ also goes to Fig. 6, where the clear releases from the 7490 decade counter, and to Fig. 5, where the 7474 overrun detector has a high applied to the clear and Dinputs to enable the detector. Also, SEQ going low enables the display counter to display the number of pulses



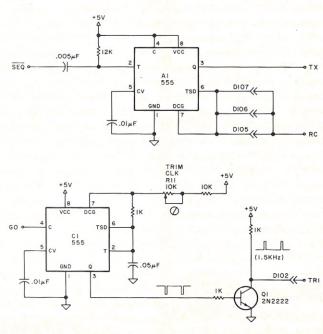


Fig. 7. Timing and control.

that were gated into CNT.

At the instant that SEQ goes low, GO goes high to remove the clear from both the highand low-range reference clocks. Both the T1 and T2 clocks go to Fig. 4, where the correct clock is selected by E-1\* or E-2\*. Since the low range is being selected in Fig. 3, E-1\* is high and E-2\* is low. With E-1\* high, the TR2 (low-range clock) is enabled, and TR1 is inhibited by E-1\* being low. TR operates at 28 kHz and is gated through Fig. 6 under the control of TX.

If the capacitor is .01 uF, the gating of TR and TX will output one pulse. If a .05 uF capacitor is being tested, the pulse on TX will be five times as long, and five clock pulses will be gated through. Since the prescaler is turned off by DB10, CNT is identical to the signal on pin 11 of C4 in Fig. 6.

These pulses are tallied by the display counter in Fig. 5 and directly decoded and displayed on the control panel display. The number showing on the display is the value of the capacitor in microfarads. The decimal, when not lit, is placed by using the exponent indicator selected by the range-select switch.

In the event that the maximum displayed value of 99 is exceeded, the D output of B4 goes low when the 7490 counts up past 9 to 0. This places a positive-going slope on the Tinput to the 7474 overrange detector

The output of the 7474 switches high and enables CLK to be gated through to alternately switch FLASH high and low. FLASH goes to pin 4 of the 7447 binary-to-decimal decoders and alternately enables and disables the outputs a through g. These outputs are normally high and are prevented from going low while pin 4 is low, so the display flashes on and off. Any time the display flashes, the value being displayed is a random number and not the value of the capacitor under test.

The source of the signal CLK is in Fig. 8, where a 74123 dual timer free-runs at all times while power is present, driving CLK on and off for equal 1/2 second intervals. The speed of CLK controls the rate of the flash when an overrange condition is detected.

The power supply in Fig. 8 is simple and direct. The LM 309K is bolted directly to the cabinet from the outside with the leads protruding into the cabinet through two holes. The regulator doesn't even get warm. The transformer is a standard 12 volt filament transformer capable of delivering 500 to 1200 milliamps. A generous amount of bypass capacitors used on the TTL circuits provide complete stability. Every chip is individually bypassed with a .01 uF disk capacitor, and several low-pass 8 uF capacitors were strategically placed on the board.

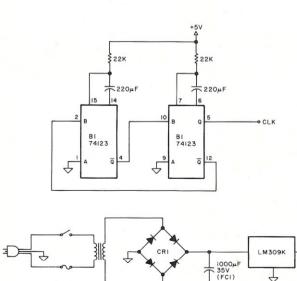


Fig. 8. Flash clock and power supply.

## **More Printing Terminals** From MICROMAIL



#### DIABLO

DIABLO

#### 1650



- Prints at 40 cps, using 88, 92, or 96 char. metalized printwheels
- Vertical resolution 1/48"; Horizontal 1/120". Capable of proportional spacing, bidirectional printing, and graphics under software control.
- Bidirectional normal and direct tabs Left, right, top and bottom margins.

R.O. \$2890.00 KSR \$3285.00

#### 1640

- Uses plastic printwheel and prints at 45 cps. Otherwise, shares identical features with 1650 including:
  - Friction or tractor feed, up to 15" wide
  - Cartridge ribbon, fabric or carbon

R.O. \$2745.00 KSR \$3140.00



#### T.I.

#### 810

- · Includes upper/lower case option.
- Bidirectional printing at 150 cps.
- Tractor-feed forms, 3" to 15"

° \$1599.00

#### Options:

- Forms length control \$100.00
- Vertical Format Control with Compressed Print \$125.00



(Shown with optional forms tractor and numeric

- Prints 10, 12, 13.2, or 16.5 characters per inch, upper/lower
- 2, 3, 4, 6, 8, or 12 lines per inch.
- Friction feed, paper width to 15

#### \$969.00

Options: Numeric keypad - \$80.00

Adjustable forms tractor \$130.00



#### DP-9500/9501 ANADEX

- High Density Graphics
- Parallel, RS-232C, and Current Loop interfaces standard.
- Double width printing
- 132/175 or 132/220 columns.
- 50 to 200+ lines/min., 150/200 CPS 9 x 7/7 x 9 font or 120/200 CPS with 11 x 9/7 x 9 font.
- 9-wire print head, 650 million
- Bi-Directional printing with shortest distance sensing logic
- · Adjustable width tractor paper feed.
- · Complete forms control.

**Call for Low Price** 

We Also Represent the Following Manufacturers:

TELETYPE

GTC

TeleVideo

TEC

SOROC

Write or Call In for Our Free Catalogue!



TO ORDER: Send check or money order to: MICROMAIL, P.O. Box 3297, Santa Ana, CA 92703. Personal or company checks require two weeks to clear. Terminals in stock are shipped the business day after receipt of certified funds. All equipment includes factory warranty.

SHIPPING: We ship freight collect by UPS when possible. Larger terminals are shipped by motor freight. Air and express delivery is available on all products. HANDLING: All orders are subject to MICROMAIL's handling charges. Less than \$750.00, add 3%. \$750.00 to \$2,000.00, add 2%. Over \$2,000.00 add 1%.

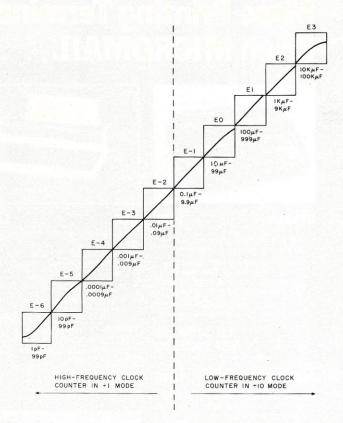


Fig. 9. Full range linearity map.

To test a capacitor of 6.4 uF, the group-select switch is placed in the EH position, and the range-select switch is set to the E-1 position. This places a low on the E-1\* line, and DB10 goes high along with E-2\*. E-1 and E-1\* at the top of Fig. 4 pull dp1 low to Fig. 5 to light the decimal point dp1. The readout now shows 0.0 after the reset button has been pushed.

When the test button is pushed, the sequence of events is similar to the low-range test. There are a couple of differences. First, with E-1\* low, TR2 is inhibited and E-2\* high enables TR1, so that TR operates at 1.5 kHz. DB10 being high to Fig. 6, the 7474 is held in a cleared condition with Q set low and Q set high. The output from C4 pin 11 in Fig. 6 is gated to the 7490 divide-by-10 prescaler. TR and TX gate 640 pulses through to pin 11 of C4. The 7490 decade counter divides the 640 pulses down to 64 pulses on CNT.

In Fig. 5, the display counter counts up to 64 and stops. With the decimal point dp1 lit, the resultant display is 6.4, which is the value of the capacitor in microfarads.

Since the full range linearity of the 555 timer isn't perfect, linearity problems arise at the upper and lower extremes and the unit becomes nearly impossible to stabilize. For this reason, two clocks were used. A very fast clock (28 kHz) with no prescaler is close to linear all

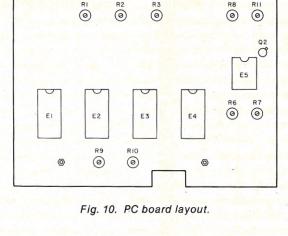
CRI

0

0

FCI

AI



the way down to the tens of pF. Upon nearing the tens of pF, the unit becomes increasingly inaccurate, but still serves as a good go, no-go tester. An accuracy tracking chart is shown in Fig. 9 for all ten ranges in the capacitance spectrum.

Due to the long time delays generated by electrolytic capacitors, a prescaler is used in conjunction with a relatively slow clock. The 1.5 kHz clock aided in stabilizing the erratic upper end of the capacitance spectrum. The accuracy of the unit tracks better than the capacitor under test. The capacitor to be tested usually has a tolerance of 10 to 20 percent. For a 19,000 uF cap, that's a range of 15,000 through 23,000

uF.

Five 19,000 uF caps were sample-tested on the E3 range, and they all tested at 20,000 to 21,000 uF. At values in excess of 50,000 uF, the tolerance of the unit begins to increase, until, at 100,000 uF, the unit's accuracy is 15 percent. A sampling of 100,000 uF capacitors measured 85,000 uF, which is 15 percent below their rated value. The capacitors themselves were rated at 20 percent tolerance, indicating that the unit is well within reasonable limits for a capacitor of this value.

Tracking over a majority of the midrange of the unit is variable, from 1 percent to 5 percent accurate. This was determined by using ten capacitors of several values and tracking the average reading. The tolerance of the capacitors was 20 percent, but the average of a group of ten tracked close to 1 percent. This forms the foundation for my tracking chart and is the method used to determine these percentages.

#### 

Fig. 11. PC board layout.

#### Construction

The PC board layout is shown in Figs. 10 and 11. The cabinet was purchased at Radio Shack, along with the common anode seven-segment displays. The wiring was all point-to-point wire wrap, using 30 gauge. No unusual parts were used in the digital capacitance meter. In fact, I selected them specifically for their availability and low cost.

The component values are not critical, and transistor types are unimportant. Simply ensure that they are NPN switching transistors with sufficient gain to allow reasonable rise and fall time. Try to get as close as possible to the clock frequencies and observe timing-related component values closely. Your particular wiring scheme may cause the calibration to be hard to achieve. If the limit of a calibrated range is reached, add or subtract resistance as reguired to center the calibration and reestablish stability. This is most likely to vary at the upper and lower extremes of the unit's range (especially toward the E-6 and E3 ranges).

When trimming up each range, favor the end of the range closest to the E0 range for accuracy. Don't allow any single capacitor to set the standard for a range. About ten capacitors give a good indication of how well the range is track-

The far left decimal point should light when the E-2 range is selected (make sure the group-select switch is on EL). and the center decimal should he lit when the selector switch is on E-1 (make sure the groupselector switch is on EH). All other ranges should not have any decimal point illuminated. These decimals are set using scientific notation, as derived from the range identifier.

#### **Testing Capacitors** of Unknown Value

The truest value of any unknown capacitor is in the range closest to E0, where a reading is obtained. If the readout shows a value of 00 after the test button has been pushed. the range is too high. Switch to a lower range and try again. If the display flashes on and off with a value indicated, the range is too low. Switch to a higher range and try again. If the display flashes on and off and the display is counting continuously, either you are much too low on the range selected or the capacitor is shorted.

Experience will be your best teacher in using the digital capacitance meter. I have come to trust and rely on mine, which has never failed me yet.

#### JOE COMPUTER\* Presents Exclusive Software: IT'S FOOTBALL SEASON!

Pro and College Football from SDL:

A TRS 80† translation of Ken Perry's popular Apple programs. These programs predict point spreads with unbelievable accuracy. They are heuristic and require about 10 minutes a week to record the weekend's results into the data base from your local newspaper. You may predict any game within seconds from the data saved on cassette or disk. Pro Football contains all 28 pro teams. College football contains an unbelievable data base of 78 teams! Each program comes with the entire 1979 season data file on cassette or disk. You can display each team's record of scores or won-loss record. A record of 4-5 weeks is required before predictions are effective so you're 

UISK College Football Cassette (48K TRS 80 Level II) Disk

Horse Race Handicapping!

Probability Handicapping Device 1 was written by a professional software consultant to TRW Space Systems. This is a complex program carefully human factored for easy use. It is a comprehensive horse racing system for spotting overlays in thoroughbred sprint races. Your computer will accurately predict the win probability and odds line for each horse based on your entries from the racing form. The next day overlaid horses can be spotted on the track tote board. The users manual contains a complete explanation of overlay betting plus much more useful information. The appendix contains a detailed tab run of a 100 consecutive race system workout showing an amazappendix contains a detailed tab into it a 100 consecutive race system workout snowing an amazing 50% return (\$.50 returned for each \$1.00 flat wager). Includes many features such as error
correction, bubble sort, line printer output, archiving, etc. The manual may be ordered seperately
for perusal for \$7.95 and credit, PHD-1 users manual and cassetts for: 8K Apple II Applesoft, 8K
Challenger (specify 1P or 4P), TRS-80 16K Level II

\$34.95

Brand new from SDL: Win At The Races another Ken Perry spectacular! This algorithm is based on a currently popular book representing the most ambitious multiple regression research on

to a cuttering potata book representing an index animous muriple regression research to thoroughbred racing to date. The probable odds and win probability for each horse are displayed. Line printer output, error correction, descending sort; all the niceties!

Win At The Races cassette (32K TRS-80 Level II) \$34.95

Disk (48K TRS-80 Level II) \$39.95

THE BOOK for the Computerized Handicapper!

WINNING AT THE RACES by William Quirin Ph.D. Computer science has come to the rescue of the racing fan. This is the first major scientific study of handicapping available to the general public, detailing what the computer reveals about class, form, early speed, and more; plus special multiple regression computer systems. A Tom Ainsle — winners circle book.

+ \$.75 P & H Order now to get on our list and receive back issues free!
Phone Orders: Mike (213) 992-0514 Systems Design Lab (213) 374-4471

Make Checks payable to: JOE COMPUTER ≥ 247 22713 Ventura Blvd., Suite F, Woodland Hills, CA 91364

\*Get on the Computers & Gambling Products mailing list for \$3.00 & receive available back issues Calif. res. add 6% tax. †TRS-80 is a Registered Trademark of Tandy Corporation

# Why Your Next CRT Should Come From MICROMAIL:



#### SOROC

**IO 120** 

- Displays 80 x 24, upper/lower case
- Separate numeric keypad and cursor
- Protected fields displayed at reduced intensity

\$689.00



#### SOROC

10 140

- · 117-key detachable keyboard with numeric cluster and cursor control
- Insert/delete line, insert/delete
- Underline, blink, reverse, 1/2 intensity, protected and blank fields.
- Printer port with independent baud rate - prints line, partial or full screen

\$1099.00



#### TELEVIDEO

912/920

- Insert/delete line, insert/delete character, line/page erase
- Reverse video, blinking, underline, ½ intensity, protected field, blank security field.
- Uses 7 x 10 dot matrix for a high quality u/l case display with descenders.
- Standard typewriter or teletype keyboard; numeric keypad.
- Model 920 includes 17 dedicated keys for function and
- Block or character transmission, auxiliary printer port.
- Cursor up, down, left, right, return, home, load, read, tab and back tab.

**Call for Low Price** 



#### TEC

510

- Reverse video, blinking, underline, 1/2 intensity, protected fields, blank security field.
- Transmit character, line, partial page, page, or unprotected data
- Cursor up, down, left, right, return, home, plus load and read

\$699.00

We Also Represent the Following Manufacturers:

DIABLO DEC **TEXAS INSTRUMENTS** ANADEX GTC TELETYPE

Write or Call In for Our Free Catalogue!



TO ORDER: Send check or money order to: MICROMAIL, P.O. Box 3297, Santa Ana, CA 92703. Personal or company checks require two weeks to clear. Terminals in stock are shipped the business day after receipt of certified funds. All equipment includes factory

SHIPPING: We ship freight collect by UPS when possible. Larger terminals are shipped by motor freight. Air and express delivery is available on all products. HANDLING: All orders are subject to MICROMAIL's handling charges. Less than \$750.00, add 3%. \$750.00 to \$2,000.00, add 2%. Over \$2,000.00 add 1%.



Although you can't always be a winner at the race track, you can cash in on the animated graphics capability of your PET.

Gary Greenberg 35-63 80th St. Jackson Hts., NY 11372

ne of the nice features of the PET is the POKE command, which places a specific character at a specific location on the PET's screen. This permits you to produce some interesting animated graphics, as illustrated in the Horse Race program in this article.

#### **Program Operation**

POKE puts a given value into a specific location in memory. Lines 1000-1090 show you the format of the POKE instruction. The number after the comma is the value placed into memory. The number before the comma is the address of the memory location in which the number is placed. As you can see from the example, either value can be a variable.

The PET screen accommodates 1000 characters in 25 lines of 40 characters each. The data in certain memory addresses dictate what appears on the screen at any particular location. The 1000 addresses starting consecutively with 32769 determine the screen display. The numeric value stored in address 32769 determines what appears in the first position on the screen (row 1, column 1). The value stored at 32873 determines what appears in the 105th position on the screen (row 3, column 25).

Every PET character has an assigned number that, when stored in one of the 1000 addresses, will display the character at the address indicated. For example, the asterisk is assigned number 42. When 42 is poked into address 32873 (POKE 32873,42), then the screen will display an asterisk at row 3, column 25. The asterisk will remain there until you either poke another value into 32873 or write over that location by running your program.

In the Horse Race program, the POKEs are used to draw the horses and advance them across the screen. The number 32, when poked into memory, produces a blank at the indicated screen location. The POKEs are arranged so that every time a horse is advanced one space, blanks are placed in all the necessary locations to erase all remnants of the old horse drawing.

In line 250 I defined the starting positions for each of the five horses by using the value A(I). As A(I) changes value, the horses are advanced across the screen. Lines 600-610 determine which horse will be moved. Subroutine 1000 causes the horse to be drawn in the proper place on the screen.

This version of Horse Race permits only one player to bet.

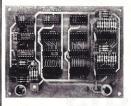
Each horse has an equal chance of winning. The computer will keep track of the player's winnings. Lines 150-170 are used to provide for a random starting point for the random number generator. The PET uses the same sequence of random numbers every time you turn it on. Since writing this program, I have learned that those lines can be replaced by 150 R = RND(-TI).

```
10 PRINT"J":GOSUB1200
20 PRINTTHE(S); "COPYRIGHT 1978 BY"
30 PRINTTHE(S); "COPYRIGHT 1978 BY"
40 GOSUB1200
80 PRINT"MELOOME TO SILICON VALLEY RACE TRACK, ":GOSUB1200
80 PRINT"NOU HAVE $500 TO START WITH. "
100 PRINT"YOU HAVE $500 TO START WITH. "
100 PRINT"HEH HORSES ARE 4:1 ODDSTO WIN. ":PRINT
110 PRINT"HEH HORSES ARE MUMBERED 1—5. "
120 PRINT"HEH ENDESS ARE MUMBERED 1—5. "
120 PRINT"HEH ENDESS ARE MUMBERED 1—5. "
120 PRINT"HEH ENDES ARE MUMBERED 1—5. "
120 PRINT"HENE THE NUMBER OF YOUR HORSE AND"
130 PRINT"HENE ENDER YOUR BET. "
120 PRINT"HORL (RIGHT$(T1$,2)):R=RND(1):NEXTI
131 FORI=ITOTHCRHOT(1):NEXTI
140 FORI=ITOTHCRHOT(1):NEXTI
150 FORI=ITOTHCRHOT(1):NEXTI
150 FORI=ITOTHCRHOT(1):DE:NEXTI
151 PRINTHORSE*;H
152 HEINT(H):IFH)0ANDHC6THENS10
153 PRINT"HORSE*;H
154 GOSUB1200:GOTO270
155 IFBCRIORS=RITHEN400
156 FORI=ITOTOHCRHOT(1):NEXTI
157 GOSUB1200:GOTO270
158 PRINT"YOU HAVE $";R1;". ";
159 GOTO310
140 PRINT"Y";
140 FORI=1TOTO:PRINT:IFI/2=INT(I/2)THENPRINTI/2;:GOSUB1200
140 PRINT"]";
141 FORI=1TOTO
142 NEXTI
143 FORI=1TOTO
144 OGSUB1000
145 NEXTI
               439 FORI=1105
440 GOSUB1000
440 GOSUB1000
450 NEXT:
600 R=INT(5#RND(1)+1)
600 R=INT(5#RND(1)+1)
610 A(R)=A(R)+1
620 I=R:00SUB1000
630 B(R)=B(R)+1
640 IFB(R)=C34THEN600
650 PRINT"#M":FORI=11015:PRINT:NEXTI
650 PRINT"#M":FORI=11015:PRINT:NEXTI
650 PRINT"HE WINNER IS NUMBER":R
670 IFH=RTHENRI=R1+44#8:00T0750
680 PRINT"YOU LOSE. "K:R1=R1-B
685 PRINT"YOU HAVE $*',R1;"LEFT."
687 IFRI=0THENPRINT"YOU'R REC. COME BACK ANOTHER DAY.":GOT09999
690 INPUT"ANOTHER RACE (Y OR N)";Z$
700 IF LEFT$(Z$,1)<>"Y"THEN9999
710 GOT0250
690 INPUT"ANDIHEA
700 IF LEFT$(Z$,1)C"Y"THEN9999
710 GOTOZ50
750 PRINT"YOU WIN $";4*B
760 PRINT"YOU WIN #";4*B
760 PRINT"YOU WIN HAVE $";R1;"."
770 GOTOG50
990 GOTOG90
1000 POKE32768+A(I)-1,32
1010 POKE32768+A(I)-1,32
1010 POKE32768+A(I)+2,160
1040 POKE32768+A(I)+3,95
1050 POKE32768+A(I)+39,32
1060 POKE32768+A(I)+39,32
1060 POKE32768+A(I)+41,32
1060 POKE32768+A(I)+41,32
1060 POKE32768+A(I)+41,32
1060 POKE32768+A(I)+41,37
1100 RETURN
1200 FORJ=1T036:PRINT"-";:NEXTJ
9999 END
READY.
                                                                  RETURN
FORJ=1T036:PRINT"-";:NEXTJ:PRINT:RETURN
```

Program listing. Horse Race program in PET BASIC run on a PET printer. The symbols between the quotes in lines 10 and 650 are the clear and home symbols, respectively.

### MICRO MISCELLANY FROM JBE 6502 MICRO-MICROCOMPUTER

### A to D D to A CONVERTER



79-287 ASSM. \$79.95 \$59.95 KIT BARE BOARD **\$29.95**  used with any system having parallel ports, and interfaces with JBE Parallel I/O Card (see below). A-D conversion time is 20µS, D-A conversion time is 5µS. Uses include speech, music synthesizing, slow scan TV, and joystick or paddle control inputs. Uses single power supply (5V), see JBE 5V power supply below. Parallel inputs and outputs include 8 data bits, strobe lines and latches. Analog inputs and outputs are medium impedance zero to five volt

The JBE A-D and D-A Converter can be

This JBE 31/2 x5" Micro-Microcomputer has the following:

- 1024 Bytes of RAM (two 2114s)
   2048 Bytes of EPROM (2716)
- Uses one 6522 via (documentation inc.)
- 2 8-bit bidirectional I/O ports
- 2 16-bit programmable timer/counters
- Serial Data Port
- Latched output and input with handshaking logic.
   TTL and CMOS compatible

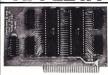
The 6502 Microprocessor is particularly suited for control functions such as temperature control, burglar alarm, electric wheelchair, lights, etc. This Micro-Micro interfaces with the JBE Solid State Switch and A-D and D-A

Converter and uses the JBE 5V power supply (see \$110.95 below). 2716 EPROM is available separately (not

80-153 ASSM. KIT BARE BOARD

89.95 included in kit or assm. board). A 50 pin connector 24.95 is included.

### APPLE II PARALLEL INTERFACE



JBE Apple II Parallel I/O Card interfaces printers, synthesizers, keyboards, and JBE A-D and D-A converter and solid state switches. This interface has handshaking logic, two 6522 VIAs and a 74LS74 for timing. Inputs and outputs are TTL compatible.

79-295 ASSM. \$69.95 \$59.95 KIT BARE BOARD \$22.95

### SOLID STATE SWITCH





Control the world! Your computer can control power to your printer, lights, stereo and 120VAC appliances up to 720 watts (6 amps at 120VAC). Input 3 to 15VDC, 2 -13 MA TTL compatible, isolation - 1500V, non zero crossing, the switch comes in a 1 or 4 channel version and includes documentation for interfacing with JBE Dimmer Control (see below). The 1 channel version is also available professionally packaged.

79-282 1 CHANNEL ASSM. \$13.95 KIT \$10.95 BARE BOARD \$ 6.95

1 CHANNEL PKGD. \$39.95

79-282 4 CHANNEL ASSM. \$49.95 KIT \$39.95 BARE BOARD \$24.95

### POWER SUPPLIES





This 2x2½" power supply uses a wall transformer for safety and is protected against short circuit and thermal breakdown. It is rated at ± 12 V 120MA and can be used as a single 24V power supply at 120 MA. It is ideally suited to operational amplifier experiments.



80-161 ASSM. \$22.95 KIT

\$18.95 BARE BOARD \$ 8.95

### **5 VOLT POWER SUPPLY**

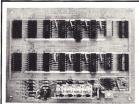
This 21/4x21/2" 5V 500MA power supply is protected against short circuit and thermal breakdown and es a wall transformer for safety. It operates JBE A-D and D-A converter, 8085 computer, 8088 computer & 6502 micro-microcomputer. Documentation is included.

80-160 ASSM. \$20.95 KIT \$16.95 BARE BOARD \$ 8.95





### DIMMER CONTROL



The JBE Dimmer Control has 4 channels, 256 brightness levels, on-board power supply and four 8-bit parallel in-put ports (not latched). This board inter-faces with the JBE Solid State Switch and Apple II Parallel Interface Card (documentation included).

\$89.95 80-146 ASSM. \$79.95

BARE BOARD \$25.95

### APPLE II DISPLAY BOARD



80-144 ASSM. \$42.95 BARE BOARD \$25.95

This handy little (3x7") board is ideal for teaching and troubleshooting. It has a run — stop, single step switch which makes identification of shorted lines between address or data-bits easy and shows single steps for and snows single steps for teaching computer logic. The display board has 16 Address LEDS, 8 Data LEDS & 1 RDY LED. All lines are buffered.

### BARE BOARDS

### **APPLE II EXTENDER BOARD**

This is what you've been waiting for! The  $3\frac{1}{2}\times2\frac{1}{2}$ " Apple II Extender Board makes troubleshooting much faster and easier! Great for use with the JBE Apple II Display Board, 50 pin Apple connector is included.

\$12.95

### CRT CONTROLLER

This intelligent CRT Controller is completely contained on a 6x6½" printed circuit board. The design is based on an 8085A Microprocessor and an 8275 Integrated CRT Controller. It features the following: Keyboard Scanning System

- 25 Lines, 80 characters/line

- 25 Lines, 80 characters/line 5x7 Dof Matrix 8085 CPU Two 8185s Two 2716s (1 for software, 1 for user programmable character generator) Serial Interface R5232 and TTL Baud rates of 110, 150, 300, 600, 1200, 2400, 4800 & 9600.

Uses +5V power supply and ±12V power supply (both available from JBE — see above)

\$39.95

### 8085 3-CHIP SYSTEM

State-of-the-art system using 3 IC's, an 8085, an 8156 and either an 8355 or 8755. The system has the following:

- 3 MHz 8085 CPU
- 256 bytes static RAM
- 2048 bytes ROM
- 38 parallel input/output lines
- 2 serial input/output lines
- Instruction set 100%
- upward compatible with 8080A
- 14-bit counter/timer

### \$24.95

### 8088 5-CHIP SYSTEM

An 8086 Family microcomputer system using 5 IC's, an 8088 CPU, and 8284 clock generator, an 8155 RAM/IO/Timer, an 8755A EPROM/IO and an 8185 (1K x 8) Static RAM. This system has the following:

- 16-bit internal architecture
- Up to 1280 bytes of static RAM
- 2048 bytes of EPROM
- 38 parallel input/output lines
- 14-bit counter/timer Instruction set 100% compatible with the 8086

\$29.95

### SPARE PARTS

INTEGRATED CIRCUITS \$ 9.95 6502 6522 2716 5 Volt \$29.95

Standard Dip Jumpers 16 Pin, 1 Ft. Length CONNECTORS \$4.95

V 99

50 Apple Connector

\$5.95



JOHN BELL ENGINEERING

ALL PRODUCTS ARE AVAILABLE FROM: JOHN BELL ENGINEERING P.O. BOX 338 • REDWOOD CITY, CA 94064 • (415) 367-1137

ADD 6% SALES TAX IN CALIFORNIA. FOR ORDERS OUTSIDÉ THE U.S.A., ÀDD 5% FOR SHIPPING AND HANDLING.

### The 16-Bit Time Trials

### These assembly-language benchmarks test a new, improved generation of microprocessors.

Allan Flippin EECO, Inc. 1601 E. Chestnut Ave. Santa Ana, CA 92701

ince my March 1980 article "Assembly-Language Benchmarks," several new microprocessors have become available. This update will examine four of them: the 8086, 6809, 68000 and Z8000.

I've also included three microprocessors

from the first piece: the 370-145 for comparison purposes and the LSI-11/23 and 9900 because both have improved execution speed. I did not recode any of the benchmarks for these microprocessors, but simply plugged in the new execution times from the manufacturers' information. Actual listings for the 8086 and 6809 benchmark programs are included with the article. (Contact the author directly for copies of other listings.)

The benchmarks and scoring methods

used are the same as for my original article with the following exceptions:

- 1. Since my data sample is smaller and more uniform, I have used averages instead of medians for my index calculations.
- 2. Execution times for the multiplication benchmark are prorated to 16 bits instead of eight bits.

### The Benchmarks

The microprocessor execution times are based on the clock frequencies listed in

```
8086 TABLE LOOKUP ROUTINE
                                   37 MICROSECONDS
                                      INSTRUCTIONS
                                   17 BYTES
                                                                 ;SET PROGRAM ORIGIN
;GET VALUE TO BE SEARCHED FOR
L ;GET NUMBER OF TABLE ENTRIES
L ;GET TABLE BEGINNING ADDRESS
0800
                         START:
                                   DRG
                                             0800H
0800: A0 00 09
                                   MOV
                                             AL, CHAR
       B9 0A 00
                                   MOV
                                             CX, LENGTH TABLE 1
0806:
       BF
           01 09
                                   MOV
                                             DI, OFFSET TABLE 1
0809: FC
                                                                  SET UP FOR AUTO-INCREMENT IN 'SCAS' INSTRUCTION
080A: F2 AE
                                   REPNZ
                                   SCAS
                                             TABLE1
                                                                  SEARCH TABLE UNTIL EITHER WE FIND THE CORRECT
                                                                  ; VALUE OR TABLE ENTRY COUNTER GOES TO O ; PROCESS ERROR IF NO MATCH
                                             ERROR
080C: 75 03
                                   JNZ
080E: 8A 45 09
                                             AL, TABLE2
                                                                           OTHERWISE, GET CORRESPONDING ENTRY
                                                                  FROM DATA TABLE
                                   END OF ROUTINE
0812
                         ERROR
                                   EQU
0812: EB FE
                                   JMF
                                             END
                                                                 , LOOP
                         END:
                                   DATA AREAS
0900
                                   DRG
                                             0900H
0900
                         CHAR:
                                                                 CONTAINS VALUE TO BE SEARCHED FOR
                                   DB
      00 01 02 03
04 05 06 07
                         TABLE1: DB
                                             0, 1, 2, 3, 4, 5, 6, 7, 8, 9 ; SEARCH TABLE
       08 09
      00 01 02 03
04 05 06 07
                         TABLE2: DB
                                             0, 1, 2, 3, 4, 5, 6, 7, 8, 9 ; CORRESPONDING SEARCH TABLE
          09
                                          Listing 1. 8086 table lookup routine.
```

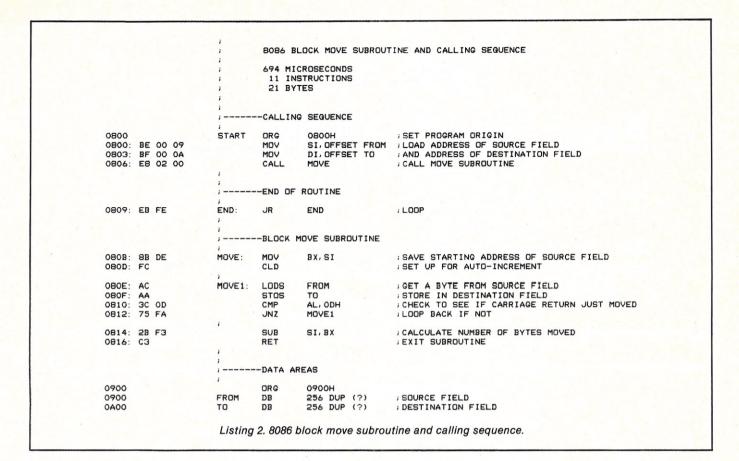


Table 1.

I have added charts to compare the members of a given manufacturer's microprocessor family with each other. I assigned performance indices of "1.000" to the eldest family member for all benchmarks and all categories. Indices for the other family members are then calculated relative to the eldest family member. These charts should indicate the better performance offered by the newer microprocessors.

The 8086 is the overall winner, doing well in all categories. It excels in memory utilization. This is because its architecture accommodates one- and three-byte instructions. In many cases, one of these can do the same task as a corresponding two- or four-byte instruction on another 16-bit microprocessor. The result is compact code, requiring about 20 percent less memory space than either the 68000 or Z8000.

The 8086 also is fast, although it is slower than the 68000, which runs at the same clock frequency. Special-purpose string processing instructions make the table lookup the 8086's fastest benchmark. The 16-bit multiply is its slowest benchmark. It requires 70 percent more time than the 68000.

In the ease of programming category, the 8086 is on par with the other microprocessors, but these figures don't mean much since the variations between the microprocessors are so small. I feel that the 8086 is more difficult to program than the

68000, LSI-11/23 or 9900. One reason is that its registers, though more versatile than the 8080's, are not completely general-purpose. Many of the instructions pertain to specific registers and cannot be used with other registers. Also, special-purpose instructions such as those used for string processing increase the number of rules that a programmer must remember in order to produce working code.

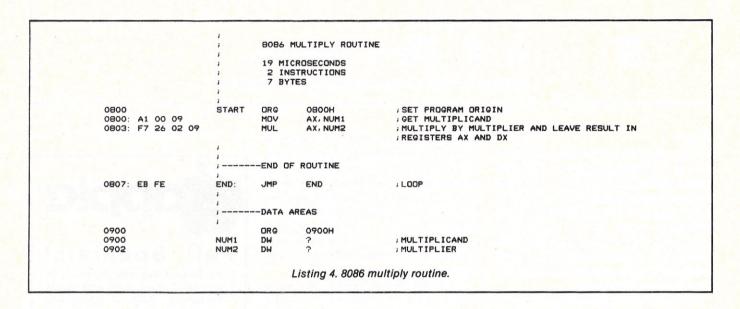
The 68000, though number two in the overall ratings, is number one in execution speed. Even though the 68000 and 8086 have the same clock frequency and similar memory timing, instructions tend to execute quicker on the 68000. For example, an instruction to load a 16-bit value from memory into a data register takes 1.5 microseconds on the 68000. A similar instruction will take 1.875 microseconds executed on the 8086.

In my opinion the 68000 is one of the easiest to program. Instead of using special-purpose instructions for string manipulation, the 68000 handles these tasks efficiently with Move and Compare instructions, using the Post-Increment and Pre-Decrement addressing modes.

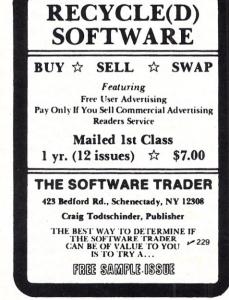
The 68000's memory utilization is only mediocre. This is the price for having a large number of registers and addressing modes. With memory prices dropping rapidly, perhaps memory utilization is no longer an important criterion for microprocessor selection. Curiously, the 6809 performs signifi-



```
8086 JUMP TABLE ROUTINE
                               6 MICROSECONDS
                                INSTRUCTIONS
                                      0800H
                                                       SET PROGRAM ORIGIN
0800
                     START
                                                       LOAD STATE WORD
0800: 8B 36 00 09
                              MOV
                                      SI, STATE
0804: D1 E6
                              SHL
                                      SI, 1
                                                       GET JUMP TABLE ENTRY AND JUMP WHERE IT POINTS
         A4 02 09
                                      JMPTBL, [SI]
                             END OF ROUTINE
080A: EB FE
                     END:
                             JMP
                                                       ; LOOP
                                      END
                          ---DATA AREAS
0900
                             DRG
                                      0900H
                     STATE
                                                       STATE WORD
0900
                             DW
                                      END, END, END, END, END ; JUMP TABLE
0902:
     0A08 0A08
                     JMPTBL DW
      0A08 0A08
      0A08 0A08
                                   Listing 3. 8086 jump table routine.
```





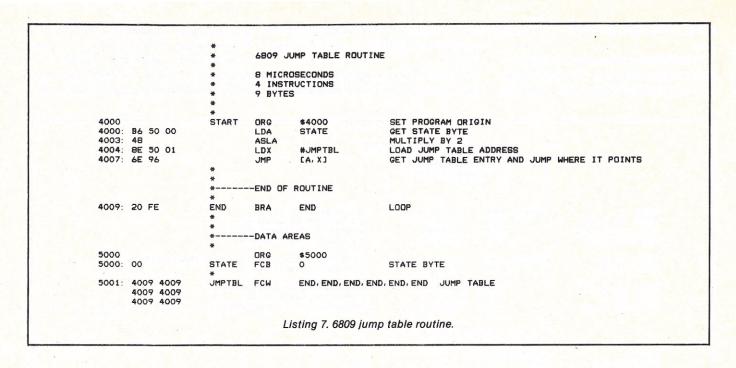


cantly better than the 68000 in this category.

The Z8000 slips behind both the 8086 and 68000 in execution time. The main reason for this is the Z8000's slow clock speed and memory timing. Memory cycles require 750 ns, compared to 500 ns for the 6809, 68000 and 8086.

The Z8000's best category is ease of programming. It requires fewer instructions to program my benchmarks than the other microprocessors. However, because of the "special case" nature of the Z8000's instruction set, it (like the Z-80) is actually much more difficult to program than the fig-

		*	6809 T	ABLE LOOKUP ROUTI	INE
		* * *		ROSECONDS TRUCTIONS ES	
4000: B8 4003: B7 4006: 88	7 50 OB	* START	ORG LDA STA LDX	\$4000 BYTE TABEND #TABLE1	SET PROGRAM ORIGIN GET BYTE TO BE SEARCHED FOR SAVE IN DUMMY TABLE ENTRY GET SEARCH TABLE ADDRESS
4009: A1		* SEARCH	CMPA BNE	, X+ SEARCH	CHECK FOR MATCH AND INCREMENT TABLE POINTER LOOP BACK IF NOT
400D: 80 4010: 22 4012: Ad	2 03	*	CMPX BHI LDA	#TABEND ERROR OFFSET-1, X	CHECK FOR MATCH ON DUMMY ENTRY GO PROCESS ERROR IF SO OTHERWISE, GET CORRESPONDING ENTRY FROM DATA TABLE
		* *	-END OF	ROUTINE	
4015 4015: 20	) FE	* ERROR END	EQU BRA	* END	LOOP
		* *	-DATA A	REAS	
5000 5000: 00	0	* BYTE	ORG FCB	\$5000 0	CONTAINS VALUE TO SEARCH FOR
04	0 01 02 03 4 05 06 07	* TABLE1	FCB	0, 1, 2, 3, 4, 5, 6, 7	7, 8, 9 SEARCH TABLE
500B: 00	9 09	TABEND	FCB	0	DUMMY ENTRY
04	0 01 02 03 4 05 06 07	TABLE2	FCB	0, 1, 2, 3, 4, 5, 6, 7	7,8,9 CORRESPONDING DATA TABLE
8000	3 09	OFFSET	EQU	TABLE2-TABLE1	OFFSET BETWEEN TABLES
		*		Listing 5. 6809 ta	ble lookup routine.  TINE AND CALLING SEQUENCE
			6809 I	Listing 5. 6809 ta	ble lookup routine.
		* * * * * * * * * * * * * * * * * * * *	6809 I	Listing 5. 6809 ta	ble lookup routine.
4000	5 42 00	* * * * * * * * * * * * * * * * * * * *	6809 I 1109 N 11 1 25 I	Listing 5. 6809 ta	ble lookup routine.  TINE AND CALLING SEQUENCE  SET PROGRAM ORIGIN
4000 4000: BI	0 BE 43 00	* * * * * * * * * * * * * * * * * * * *	6809 I 1109 N 11 1 25 I	Listing 5. 6809 ta	ble lookup routine. TINE AND CALLING SEQUENCE
4000 4000: Bi 4003: Ii	0 BE 43 00	* * * * * * * * START	6809 I 1109 I 11 25 I 25 I CRG LDX LDY JSR	Listing 5. 6809 ta	ble lookup routine.  TINE AND CALLING SEQUENCE  SET PROGRAM ORIGIN LOAD ADDRESSES OF SOURCE AND DESTINATION FIELDS
4000 4000: Bi 4003: Ii	0 8E 43 00 D 41 00	* * * * * * * * START	6809 I 1109 I 11 25 I 25 I CRG LDX LDY JSR	Listing 5. 6809 ta	ble lookup routine.  TINE AND CALLING SEQUENCE  SET PROGRAM ORIGIN LOAD ADDRESSES OF SOURCE AND DESTINATION FIELDS
4000 4000: 81 4003: 14 4007: 81	0 8E 43 00 D 41 00	* * * * * * * * * * * * * * * * * * *	6809 I 1109 N 11 25 I 	Listing 5. 6809 ta	SET PROGRAM ORIGIN LOAD ADDRESSES OF SOURCE AND DESTINATION FIELDS CALL BLOCK MOVE SUBROUTINE
4000 4000: 81 4003: 14 4007: 81	0 8E 43 00 D 41 00	* * * * * * * * * * * * * * * * * * *	6809 II 1109 N 11 1 25 II	Listing 5. 6809 ta	SET PROGRAM ORIGIN LOAD ADDRESSES OF SOURCE AND DESTINATION FIELDS CALL BLOCK MOVE SUBROUTINE
4000 4000: 81 4003: 11 4007: 81	0 8E 43 00 D 41 00	* * * * * * * * * * * * * * * * * * *	6809 II 1109 P 1	Listing 5. 6809 ta	SET PROGRAM ORIGIN LOAD ADDRESSES OF SOURCE AND DESTINATION FIELDS CALL BLOCK MOVE SUBROUTINE  LOOP  SOURCE FIELD
4000 4000: 81 4003: 11 4007: 81	0 BE 43 00 D 41 00	* * * * * * * * * * * * * * * * * * *	6809 II 1109 P 1	Listing 5. 6809 ta	SET PROGRAM ORIGIN LOAD ADDRESSES OF SOURCE AND DESTINATION FIELDS CALL BLOCK MOVE SUBROUTINE  LOOP  SOURCE FIELD
4000 4000: 81 4003: 11 4007: 81 400A: 24 4200 4300	0 BE 43 00 D 41 00 O D 41 00 O D 41 00 O D 41 00 O D D D D D D D D D D D D D D D D D	* * * * * * * * * * * * * * * * * * *	6809 II 1109 M 11 25 II CRG LDX LDY JSREND OF BRADATA 6 EQU EQUBLOCK ORG	Listing 5. 6809 ta  BLOCK MOVE SUBROUT  MICROSECONDS INSTRUCTIONS BYTES  NG SEQUENCE  \$4000 #FROM #TO MOVE  FROUTINE END  AREAS  \$4200 \$4300  MOVE SUBROUTINE  \$4100	SET PROGRAM ORIGIN LOAD ADDRESSES OF SOURCE AND DESTINATION FIELDS CALL BLOCK MOVE SUBROUTINE  LOOP  SOURCE FIELD DESTINATION FIELD SET SUBROUTINE ORIGIN
4000 4000: 81 4003: 11 4007: 81 4004: 20 4200 4300 4100: 34 4104: A1 4104: A1 4106: 81	0 BE 43 00 D 41 00 O FE	* * * * * * * * * * * * * * * * * * *	6809 II 1109 N 111	Listing 5. 6809 ta  BLOCK MOVE SUBROUT  MICROSECONDS INSTRUCTIONS BYTES  NG SEQUENCE  \$4000 #FROM #TO MOVE  END  AREAS  \$4200 \$4300  MOVE SUBROUTINE  \$4100  X  , X+ , Y+ #\$0D	SET PROGRAM ORIGIN LOAD ADDRESSES OF SOURCE AND DESTINATION FIELDS CALL BLOCK MOVE SUBROUTINE  LOOP  SOURCE FIELD DESTINATION FIELD  SET SUBROUTINE ORIGIN SAVE SOURCE FIELD ADDRESS ON STACK GET A BYTE FROM SOURCE FIELD AND INCREMENT POINTER SAVE IN DESTINATION FIELD AND INCREMENT POINTER SAVE IN DESTINATION FIELD AND INCREMENT POINTER CHECK FOR CARRIAGE RETURN JUST MOVED



ures indicate.

The 6809 does surprisingly well considering its 16-bit competition. It consistently outperforms all of the previously tested eight-bit microprocessors in all categories. Its execution time ratings are better than both the LSI-11/23 and the 9900. Its memory utilization is second only to the 8086. This is impressive for what amounts to an upgraded 6800.

However, I must disclaim the 6809's good numerical performance in the multiplication benchmark. Since the 6809 does not have a divide instruction, its real performance in arithmetic processing will be much less than indicated by my benchmark. Even so, the 6809 should perform better in arithmetic processing than the older eight-bit microprocessors.

The new 16-bit microprocessors offer significant improvements in performance over their eight-bit predecessors. On the average, the 16-bit microprocessors executed my benchmarks two to three times as fast as the earlier eight-bit microprocessors. Their benchmarks also required about half as many instructions and 25 percent less memory space. However, as demonstrated by the 6809, eight-bit microprocessors can

### SUPERIOR SOFTWARE PACKAGES FOR THE

DISK BASED

TRS-80\*

### SMARTTERM

·\$79.95

UNQUESTIONABLY THE BEST SMART TERMINAL PACKAGE FOR THE TRS-80

- True Break Key
- · Auto Repeat (Typomatic) keys
- Programmable 'soft' keys
- Forward/Reverse Scrolling Multipage Display
- Transmit from Disk File, Screen or Buffer
- Receive to Disk File, Buffer or printer
- Multi Protocol Capability

### SPOOL-80

• \$39.95

A TRUE DISK-TO-PRINT DESPOOLER FOR THE TRS-80

- Print Disk Files While Running Other Programs
- Prints Compressed Basic Files
- Includes RS-232 Driver for Serial Printers

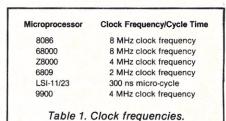
CALL US FOR YOUR CUSTOM V 253 SOFTWARE REQUIREMENTS

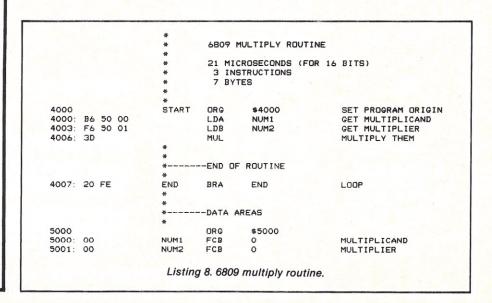
MICRON, INC. Model II 10045 Waterford Drive Versions Ellicott City, MD 21043 Available (301) 461-2721 Soon

TRS-80 is a Trademark of Tandy Corp.

### Conclusions

All of the microprocessors perform quite well. The overall rating index for the lowestranked microprocessor is only 50 percent higher than that for the highest-ranked one. With such a small variance in performance, price may therefore become the deciding factor when choosing between the microprocessors in this comparison.





## PMC-80 Level II 16K at \$645



### SOFTWARE COMPATIBLE

- · Reads all Level II BASIC tapes
- · Reads all SYSTEM tapes
- Full range of peripherals

- · Video output for monitor and TV · Optional FASTLOAD at 8000 band
- Optional Upper/Lower case

The PMC-80 is a "work-alike" computer to the popular TRS-80\* Model I, Level II by Tandy, Radio Shack, The PMC-80 has 16K bytes of RAM and the complete Level II 12K BASIC ROM by Microsoft that makes it 100% software compatible with programs from Radio Shack and from the hundreds of other independent suppliers. The built-in cassette player reads standard Radio Shack programs for the TRS-80.

Sold through computer stores.

The PMC-80 will operate with any of the many peripherals Radio Shack and other independent vendors have invented to plug into the TRS-80. Most importantly, the Interface Adapter permits Expansion Interfaces with memory expansion to 48K to be added. An Expansion Interface will also permit the addition of Radio Shack compatible 51/4" disks and disk operating systems. RS 232, printers, etc.

\*TRS-80 is a registered trademark of Tandy, Radio Shack.

Personal Micro Computers, Inc. -112

475 Ellis Street, Mountain View, CA 94043

(415) 962-0220

# Buy By Mail and Save!

# COMPUTERS

INTERTEC SuperBrain® 32K .	\$2495
64K RAM, List \$3345	\$2695
64K Quad, List \$3995	\$3395
NORTH STAR Horizon I®	
16K D.D. Kit	\$1259
32K D.D. Kit	\$1579
32K Assembled, List \$2695	\$2149
Horizon 2 32K DD, Assm., \$3095	\$2439
32K QD, Assm., List \$3595	\$2859



<b>CROMEMCO Z-2</b> , List \$995	\$ 829
System 2, 64K, List \$3990	\$3179
System 3, 64K, List \$6990	\$5479
ATARI® 400, List \$630	\$ 489
800, List \$1080	\$ 839
TI-99/4, List \$1150	\$ 985

### **DISK SYSTEMS**

THINKER TOYS®	Discus 2D .	\$ 939
Dual Discus 2D		\$1559
Discus 2+2, List \$	1549	\$1288

PRINTERS & TERMINALS
PAPER TIGER IDS-440 \$ 849
with Graphics Option \$ 949
CENTRONICS 730-1, List \$995 . \$ 639
737, List \$995 \$ 849
T.I. 810
INTERTUBE II, List \$995 \$ 729
PERKIN-ELMER Bantam 550 \$ 789
TELEVIDEO 912C
920C
HAZELTINE 1420 \$ 839
1500
SOROC 120 \$ 745

### FLOPPY DISKS SPECIAL

5 1/4" Box of 10 ONLY \$29.95

(specify TRS-80, North Star, SuperBrain, etc.)

Most items in stock for immediate delivery. Factory sealed cartons, w/full factory warranty. NYS residents add appropriate sales tax. Prices do not include shipping. VISA and Master Charge add 3%. C.O.D. orders require 25% deposit. Prices subject to change without notice.

# Computers Wholesale 227

P.O. Box 144 Camillus, NY 13031

VISA (315) 472-2582

master charge

be made to perform quite well, and actually better than some 16-bit microprocessors.

One of the selling features for the 8086, 68000 and Z8000 is the amount of memory they can access. All three can address mil-

lions of bytes, which should be plenty for most hobbyists. However, I limited my addressing range to 65,536 bytes. If more memory is addressed, the code will be larger and slower. ■

	TAI	BLE L	OOKUP	BL	DCK M	OVE	JUI	1P TA	BLE	MUL	TIPLY	
PROCESSOR	TIME	RANK	INDEX	TIME	RANK	INDEX	TIME	RANK	INDEX	TIME	RANK	INDE
8086	37	1	. 462	694	2	. 662	6	2	. 677	19	3	1.000
68000	43	2	. 538	488	1	. 466	5	1	. 565	11	2	. 579
Z8000	48	3	. 600	1068	4	1.019	8	3	. 903	20	4	1. 053
6809	84	4	1.050	1109	5	1.058	8	3	. 903	21	5	1. 105
LSI-11/23	94	5	1. 175	1196	.6	1.141	10	6	1. 129	31	7	1. 632
370-145	109	6	1.362	1027	3	. 980	8	3	. 903	10	1	. 526
9900	145	7	1.812	1756	7	1. 675	17	7	1.919	21	5	1. 105
AVERAGE	80		i	1048	3		8.4	7	:	19		

Table 2. Execution time (in microseconds).

	TAI	BLE	LOOKUP	BLC	OCK	MOVE	JUM	IP TA	ABLE	MUL	TIPL	-Υ
PROCESSOR	NO.	RAN	K INDEX	NO.	RAN	K INDEX	NO.	RAN	INDEX	NO.	RANK	INDE
8086	8	2	1. 057	11	2	1.013	3	. 1	. 778	2	. 1	. 933
68000	8	2	1.057	11	2	1.013	4	3	1.037	2	1	. 933
Z8000	5	1	. 660	8	1	. 737	4	3	1.037	2	1	. 933
6809	8	2	1.057	11	2	1.013	4	3	1.037	3	7	1. 400
LSI-11/23	8	2	1.057	11	2	1.013	3	1	. 778	2	1	. 933
370-145	8	2	1.057	13	7	1. 197	5	7	1.296	2	1	. 933
9900	8	2	1.057	11	2	1.013	4	3	1.037	2	1	. 933
AVERAGE :	7.6	5	1	10.5	,	- 1	3. 9	,	- '	2. 1		

Table 3. Ease of programming (in number of instructions).

	TA	BLE I	LOOKUP	BL	OCK	MOVE	JU	MP T	ABLE	MUI	LTIP	_Y
PROCESSOR	NO.	RAN	K INDEX	NO.	RAN	K INDEX	NO.	RAN	K INDEX	NO.	RAN	( INDE
8086	17	1	. 708	21	1	. 728 !	10	2	. 886	7	1	. 907
68000	26	4	1.083	28	4	. 970	12	4	1.063	8	3	1. 037
Z8000	20	2	. 833	26	3	. 901	12	4	1.063	8	3	1. 037
6809	21	3	875	25	2	. 866	9	1	. 797	7	1	. 907
LSI-11/23	26	4	1.083	30	5	1.040	10	2	. 886	8	3	1. 037
370-145	32	7	1. 333	42	7	1. 455	14	7	1.241	8	3	1. 037
9900	26	4	1.083	30	5	1.040	12	4	1.063	8	3	1. 037
AVERAGE I	24		1	28.	9	1	11.3	3	į	7. 7	7	

Table 4. Memory utilization (in bytes).

### Credits

Thanks to the following people who helped with this update: Jim Howell, for the 6809 code; Don Barnes of Motorola, for the 6809 and 68000 info; and Paul Stapinski of AMD, for the Z8000 info.

For a further look at the 8086, 68000 and Z8000 16-bit microprocessors, see Kilobaud Microcomputing. "The 16-Bit Super Processors Are Here," August 1980, p. 26.

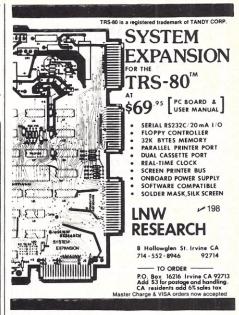
			AV	ERAGES BY	/ BENCHMA	ARK		
	TABLE	LOOKUP	BLOCK	MOVE	JUMP	TABLE	MULTI	PLY
PROCESSOR	RANK	INDEX	RANK	INDEX	RANK	INDEX	RANK	INDEX
8086	2	. 742	1	. 801	1	. 780	3	. 947
68000	3	. 893	2	. 816	2	. 888	2	. 850
Z8000	1	. 698	3	. 886	5	1.001	4	1.008
6809	4	. 994	4	. 979	3	. 912	6	1. 137
LSI-11/23	5	1.105	5	1.065	4	. 931	7	1. 201
370-145	6	1. 251	6	1.211	6	1. 147	1	. 832
9900	7	1. 317	7	1. 243	7	1. 340	5	1.025
i						i		

Table 5. Averages by benchmark	Table 5	Avera	ges by	benchmark
--------------------------------	---------	-------	--------	-----------

			AV	ERAGES BY	Y CATEGOR	Y		
	EXECU TIME	TION	EASE PROGR	OF AMMING	MEMOR UTILI	Y ZATION	OVERA	LL
PROCESSOR	RANK	INDEX	RANK	INDEX	RANK	INDEX	RANK	INDEX
8086	2	. 700	2	. 945	1	. 807	1	. 817
68000	1	. 537	4	1.010	5	1. 038	2	. 862
Z8000	3	. 894	1	. 842	3	. 958	3	. 898
6809	5	1.029	7	1. 127	2	. 861	4	1. 006
LSI-11/23	6	1. 269	2	. 945	4	1. 012	5	1. 075
370-145	4	. 943	6	1. 121	7	1. 266	6	1. 110
9900	7	1.628	4	1.010	6	1. 056	7	1. 231

Table 6. Averages by category.

			AVERAGES BY	BENCHMARK	
PROCESSOR	TABLE LOOKU	P	BLOCK MOVE	JUMP TABLE	MULTIPLY
		1			
8085	. 938	1	. 947	. 917	. 905
8086	. 573	-	. 754	. 472	. 134
PROCESSOR	EXECUTION TIME		AVERAGES BY EASE OF PROGRAMMING	MEMORY	OVERALL
8085	. 780	!	1.000	1.000	. 927
8086	. 339	1	. 458	. 654	. 484



# NONPROFIT PEOPLE'S SOFTWARE

Up to 77 high-quality programs TRS-80 Lev. II: only \$10.95!

Tape 3, People's Pascal I \$19.95 Tape 6P, PASPATCH, patches old Pascal II (no longer avail.) to use printer, floppy \$15.00 Tape 1, 34 bus., edu'l., game programs \$10.95 Tape 2, 77 programs from Osborne book: 'Some Common Basic Programs' \$10.95 Tape 5, 24 bus., edu'l., game programs \$10.95 Tape 7, 31 bus., edu'l., game programs \$10.95 Tape 8, incl. high-speed tape loader, more \$10.95 Overseas, \$1 postg. per tape; CA res. add tax



Box 159 San Luis Rey CA 92068



### MAGIC WAND \$349.00

MANY ARTICLES HAVE PRAISED THIS CP/M\* BASED WORD PROCESSING SOFTWARE AS THE BEST. NOW, THE BEST IS EVEN BETTER!
VERSION 1.1 ADDS SUCH CAPABILITIES AS
FORMATTING TO THE SCREEN AND BIDIRECTIONAL PRINTING. THIS TRULY RE-MARKABLE SOFTWARE CAN BE YOURS FOR THIS TRULY REMARKABLE PRICE. SEND CHECK OR MONEY ORDER (TEXAS RESIDENTS ADD 5% TAX) TO:



MAGIC WAND IS A TRADEMARK OF SMALL BUSINESS APP. INC. C/PM IS A REGISTERED TRADEMARK OF DIGITAL RESEARCH CORP. REQUIRES 8080/280, CP/M, AND 32K RAM

TONE SIGNALING Generators For Any Rotary Phone

Soft-Touch \$34.95

Porta-Touch \$59.95

Add \$1.00 for shipping. Tex. Res. add 5% Sales Tax.
Replaces mouth piece on most phones for direct connection with Soft-Touch tone. FCC Approved.

Add \$1.00 for shipping. Tex. Res. add 5% Sales Tax.
For use with GTE when Touch will not fit. Him touch with Soft-Touch tones. 9 volt battery properties of the soft of the

For use with GTE where Soft-Touch will not fit. Held over mouthpiece to amplify signal tones. 9 volt battery powered.

 Phone Banking ● Mobile Radio ● Central Dictation ● Paging ● Check Verification ● WATS extender ● Order Entry ● Call Diverters ● SPC Sprint, MCI Execunet, ITT City-Call ●

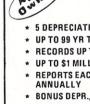
> R & R Marketing > 46 P.O. Box 120005 Arlington, Tex. 76012 817/277-4198

:		AVERAGES	BY BENCHMARK	
PROCESSOR	TABLE LOOKUP	BLOCK MOVE	JUMP TABLE	MULTIPLY
6809	. 785	. 775	. 481	241
68000	. 714	. 665	. 474	. 192
		AVERAGES	BY CATEGORY	
1	EVECUTION	EASE OF	MEMORY	OVERALL
PROCESSOR	TIME		UTILIZATION	
	TIME	PROGRAMMING	1	[
PROCESSOR :			UTILIZATION	. 571

Table 8. 6809, 68000 compared to 6800.

		AVERAGES	BY BENCHMARK	
PROCESSOR	TABLE LOOKUP	BLOCK MOVE	JUMP TABLE	MULTIP
	- 1		1	
Z8000 !	. 719	. 933	. 607	1 .21
		AVERAGES I	BY CATEGORY	
PROCESSOR	EXECUTION TIME	EASE OF PROGRAMMING	MEMORY UTILIZATION	OVERAL
	1		1	1
Z8000 !	. 532	. 445	. 881	. 61

### FIFTY BUS SYSTEMS 32K 6800s from . . . . . . . \$1694.59 Fully Expandable 2114L 300ns STATIC RAM CHIPS . . \$5.90 FACTORY PRIME From the same shipment we use in our professional quality boards, Add \$5.00 Handling on Orders Under \$200.00 32K STATIC RAM BOARD FOR THE SS50 AND SS50C BUS (SWTP etc.) SS50C Extended Addressing (can be disabled). 4 separate BK blocks 5 ccketed for 32K 6 Write Protect 6 Write Protect Socketed for 32K Gold Bus Connectors 16K . . . . . . . . . . . Phone, write, or see your dealer for details and prices on our broad range of Boards and Systems for the SS50/SS50C BUS including our *UNIQUE 80 x 24 VIDEO BOARD*, and our AC Power Control Products for all computers. $\widehat{\mathbf{o}}$ 1337 W. 37th Place • Chicago, IL 60609 (312) 927-5510 • TWX 910-221-4055 The Company that delivers. Quality Electronic products since 1975.



### **DEPRECIATION PROGRAM**

- \* 5 DEPRECIATION RATES
- UP TO 99 YR TERM
- RECORDS UP TO 600 ITEMS ON DISK
- **UP TO \$1 MILLION FOR EACH ITEM**
- REPORTS EACH MONTH, QUARTER, OR
- BONUS DEPR., INVESTMENT CREDIT
- \* PRO-RATES DEPRECIATION
- \* UPDATE RECORDS EACH YEAR
- \* EQUIPMENT INVENTORY
- \* FISCAL YEAR BASED
- \* CONVERT METHODS ANY TIME
- \* AN ACCOUNTANTS DREAM

VISA & M/C USERS - CALL 509-943-9004

MONEYDISK 516 WELLSIAN WAY RICHLAND, WA 99352

DEALER INQUIRIES INVITED



### CORRESPONDENCE INDEX MAGAZINE ARTICLE DATA BASE AUTOMATED AUTHORS NOTEBOOK RECIPE DATA BASE

All are current applications of INFORMATION MASTER, a simple yet powerful information retrieval program for CP/M systems. Don't worry about key fields and maximum field length, that is for accounting systems. Retrieve essentially unlimited text using combinations of keywords to quickly find exactly what you want. Search a 500 entry data base in 12 to 15 seconds.

INFORMATION MASTER runs on 8080 or Z-80 microcomputers using a CP/M compatible operating system and having at least two disk drives and 32K of memory. On 8" single density and many popular 5" disk formats. Write for currently available formats and notes on the above applications.

INFORMATION MASTER program is shipped ready to run, on disk with demonstration data base and 22 page users manual.

\$37.50, postage paid

Island Cybernetics 279 P.O. Box 208, Port Aransas, TX 78373 (512) 749-5843

GIMIX® and GHOST® are Registered Trademarks of GIMIX INC.

### CP/M®1 - based Business Software for TRS-80®2 computers on . . . ... the fastest Mod-II CP/M with the most features!!!

- Over 610,000 bytes/disk
- Downloading package included
- 1,200 baud operation of serial printers without data loss
- Single drive backup

MOD-II CP/M ..... \$250.00

- Mixed single/double density on any of 4 drives (even a 1-drive system)
- Ultra-fast disk operation Emulation of cursor addressing for any of several "dumb" CRTs

MOD-I CP/M ..... \$150.00

- Auto-LF printer support & ASCII top-of-form software (LPIII)
- Supplemental document describing our implementation
- User-settable function keys

CBASIC2®3 (Mod I or II) ...... \$110.00

The following software for Mod-II CP/M only unless otherwise stated (\*-requires CBASIC2):

RM/COBOL®4 - Only COBOL for CP/M with alternate keys (multikey ISAM), CRT screen handling, interactive debug, Z80 code, and the most useful Level 2 features. Compatible with Tandy's COBOL-but runs faster! ......\$495.00

PMS (Property Management System) - Interactive, menu-driven system includes full G/L, budgeting, cash journal, delinquency list, tenant activity/rent roll, complete audit trail and reports on vacancies, lost rent, and vendors ......\$650.00\*

demo disk & manual ..... 75.00\* APH (Automated Patient History) - General-purpose questionasking, answer-printing system furnished as self-administered review-of-systems general patient history (Mod-I also) ... \$175.00

MAGIC WAND®5 - Full-feature word processing, true proportional spacing, file merging, and use of full-screen editor for source programs or data ...... \$400.00 RPA (Residential Property Analysis) - Analyzes income and expense, financing, taxes, inflation and depreciation on home, condo, or apartments over a user-selectable time. Shows payoff in terms of ROI, Cap rate, cash-on-cash. Amortization schedules and .....\$300.00\* worksheet .....

demo disk & manual ..... RBC (Rent/Buy Comparison) - Sales or investment tool to compare renting and savings account investment vs. purchasing a particular property \$250.00\* demo disk & manual 35.00\*

Osborne & Assoc. CBASIC source programs (Mod-I also): Payroll w/Cost Accounting ...... \$250.00\*

Accts. Payable/Accts. Receivable ...... \$250.00\*

General Ledger w/Cash Journal ......\$250.00\* O&A CBASIC Books (ea.) ...... \$ 20.00

Verbatim®6 media: (Qty. 100 prices)

5¼" single density \$2.50 ea. 8" certified double density \$4.00 ea.

450' tape cartridges ......\$20.00 ea.



8041 Newman Ave., Suite 208 C Huntington Beach, CA 92647 (714) 848-1922

Registered trademark of:

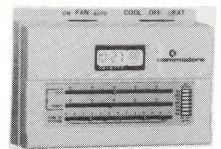
- <sup>®1</sup>Digital Research
- <sup>®2</sup>Tandy Corp.
- ®3Compiler Systems, Inc.
- <sup>®4</sup>Ryan-McFarland Corp.
- Small Business Applications, Inc.
- ®6Verbatim Corp.

Distributed in U.K. by: Microcomputer Applications Ltd. 11, Riverside Court,

TEL: (0734) 470425

Caversham, Reading, England

### g commodore 2001 **SAVE UP TO 30%** ON YOUR FUEL BILLS MICRO ELECTRONIC THERMOSTAT



FOR GAS. **ELECTRIC OR** OIL HEAT & AIR CONDITIONING

\$150°°

### TAX CREDIT OF 15% ON PURCHASE PRICE Typical Savings (%)

	- Night	Setback	Night & Day	Setback
City	5°F	10°F	5°F	10°F
Atlanta	11	15	20	27
Chicago	7	11	14	21
Los Angeles	12	16	22	30
<b>New York City</b>	8	12	16	23
	IMPTALLATION WE	THE A CONCUMBATIVE		



South Bend, IN 46660 rtion: (219) 277-4655

Toll Free Order Line: 1-(800) 227-1617 ext. 349

COLOR-COBED TERMINALS, SLIDE CONTROLS, 1 YR. LIMITED WARRANTY COMPLETE WITH INSTRUCTION MANUAL & HOWR

Shipping anywhere in the Continental U.S.

**CENTRONICS - PARALLEL** 

7x7 Dot Matrix • 80 char./line . Avg. 30 lines/min. • 3-way paper handling . excellent

print quality



Parallel \$849 Serial Interface \$884

The same characteristics as the 730-1 but with proportional spacing. Great for word processing.

### THE 700 SERIES - 132 COLUMN PARALLEL PRINTERS

Model	Avg. lines Per Min.		Ribbon Cartridge	Char./	PRICE
700-9	40	9x7	Std.	10	1,287
701-9	70	9x7	Std.	10	1,596
702-9	140	9x9	Std.	10	2,155
703-9	200	9x9	Std.	10	2,685

Send your order, shipping address, tel. no. and your personal or company check or money order to:

205 Lewis St., Lynn. Mass. 01902 (617) 599-5231 Sorry - NO Phone orders 2-6 weeks delivery • Mass. Res. add 5% tax

IN CALIF 1-(800) 772-3545 ext 349

### Machine-Language Techniques For the 1802

### Puts zip into the COSMAC VIP.

Gerald Strope 1504 Strothmore Court Raleigh, NC 27609

he RCA COSMAC VIP is a single-board processor using the 1802 chip. The processor hardware is well explained in two articles entitled "COSMAC Double Play" in the May 1979 issue of Kilobaud Microcomputing, so I will not repeat that here. This article will deal with the use of machine language in the VIP.

### Introduction

The CHIP-8 language that was developed for the COSMAC VIP is quite versatile for use in programming many varied applications. It is my opinion, though, that all CHIP-8 programmers will come to a point where they will want to do some particular function that is not possible in CHIP-8, and will need to write a machine-language subroutine.

This article is a collection of ideas and techniques I have compiled while trying to put machine language to work in the VIP. I hope some of these ideas will be useful to you when you try your first machine-language subroutine. I don't intend to write a tutorial on the CHIP-8 or 1802 instruction set in this article. CHIP-8 is covered well in the COSMAC VIP instruction manual, and I suggest you read Tom Pittman's "A Short Course In Programming" (Netronics, 333 Litchfield Rd., New Milford CT 06776) for 1802 machine-language basics. I will try to explain my programs in enough detail so the reader will be able to understand them, assuming the reader has some background in CHIP-8 and 1802 machine language.

After assembling my COS-MAC VIP kit and testing it out, I first wanted to try using some Elf-2 programs I had seen in various magazine articles. I ran into some differences almost immediately in Elf-2 and VIP hardware. The first problem I ran into is that the Elf-2 programs use a 6C instruction to input a byte from the keyboard. The 6C instruction is not valid on the VIP;

ADDRESS	CODE	STEP	COMMENTS
0017	F800B4	1	put 00 into R4.1,
1A	B5 BAAC		R5.1, RA.1, RC.0
1D	F827A4		R4=0027
20	F8C8A5		R5=00C8
23	F8E0AA		RA=00E0
26	D4E5	1	P=R4, X=R5
28	62	2	m at RX 1sd to keyboard latch
29	3637		branch if EF3=1
2 B	25F0	3	R5-1, m at RX→D
2 D	FC0155		add 01, store in m at R5
30	FOFB10		m at RX→D, OR imm 10-D
33	324D		branch if D=0
35	3052		go to 0052
37	25F0	4	R5-1, m at RX→D
39	8C3A63		RC. 0→D, branch if D not 0
3C	F05A		m at RX+D, store in m at RA
3E	3E 437B		walt for key released
41	303E		and turn Q on
43	4A2AFE		m at RA→D, RA-1, shift
46	FEFEFE		left four times
49	1C5A		RC+1, store in m at RA
4 B	305A		go to 005A
4 D	FC0055	5	reset m at R5 to 00
50	3028		go to 0028
52	OAFBA1	6	m at RA→D, OR imm A1-D
55	3A 28		branch if D not 0
57	7B3028		turn on Q, go to 0028
5A	F820B6	7	load 20 Into R6.1
5 D	26	102.0	R6-1
5E	963228		R6.0+D, branch if D=0
61	305D		go to 005D
63	2 CFOEA	8	RC-1, m at RX $\rightarrow$ D, X=A
66	F1	1155	M at RA or-D
67	E55A7B		X=5, store D in m at RA, Q on
6A	3E5A		branch to 005A when key released
6 C	306A		go to 006A
			isting 2.

the VIP uses a keyboard scan technique instead (see Fig. 1).

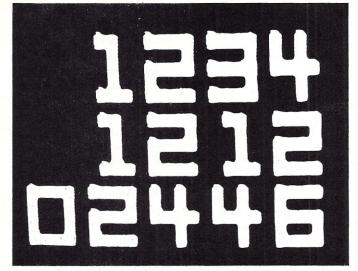
Another difference is the use of the 64 output instruction in the Elf programs. This output instruction will do nothing on the VIP because it does not have an output indicator. The TV display is used for all output.

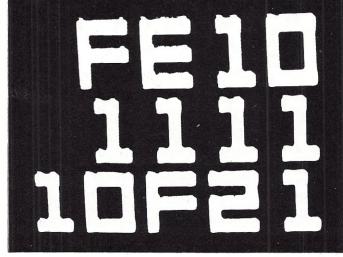
### Inputting and Outputting Data

I will go into methods of solving both of these problems later in this article, but first let's kick off the display so we can see what we are doing. The program in Listing 1 will set up the proper pointers to use the refresh routine in the 512 byte ROM. Register B.1 contains the desired display page (page zero, in this case). Register 2 is the stack pointer. Register 1 points to the refresh routine in the ROM. Register 3 is the main program register. There is a branch to itself in position 0017 that we will remove when we add on to this program in the next step.

Now page 0 of RAM is displayed on the screen. This is convenient because now we will enter a program into page 0, and you can watch a scan loop for the keyboard increment and see a shift instruction operate. If

ADDRESS	CODE	STEP	COMMENTS
0000	F800BB	0	Display=page 0
03	F806B2		R2=06CF, stack pointer
06	F8CFA2		
09	F881B1		R1=8146, refresh routine
OC	F846A1		in ROM
OF	90B3		R3=0015, main program
11	F815A3		register
14	D3		R3=program counter
15	E 269		X=R2, turn on TV
17	3017		branch to 0017 (stop loop





The addition program with an answer without a carry from the high order position.

The addition program with an answer with a carry from the high order position.

you forget a step, as I have done, you can watch your program change and disintegrate before your very own eyes. If you see this happening, hit the reset quickly before the refresh pointers are wiped out. If that happens, you have to go back to 0000 and enter it all again.

With the program displayed on the screen, it is sometimes easy to see if a register is incrementing when you don't want it to: Bytes of data will fill up the screen until they crash into part of the program, or some other similar indication.

Listing 2 will scan the keyboard, input a byte of data, place this byte of data in memory location 00E0 and check to see if the byte = hex A1. If it equals A1, turn on the Q light.

The program works as follows:

Step 1-Initialize.

Step 2-Load the least significant digit (LSD) of memory at register 5 into the keyboard latch and test for an EF3 = 1.

Step 3-Scan 00-10 through memory at register 5. When it equals 10, branch to step 5.

Step 4-Program is at this step because an EF3=1 occurred. Take memory at R5 location (this is equal to the key pressed) and store in memory at register A. Wait for key released, then shift data into the left half of the byte and store back at RA memory location. Increment register C, which acts as a flipflop indicator to determine if the

left or right half of the byte is being entered. Branch to debounce routine at step 7. This wastes time to make sure the key is fully up before turning the program loose to start scanning again.

Step 5-Reset memory at R5 location to 00.

Step 6-Turn on Q if memory at RA = hex A1 (this step is just to demonstrate that a full byte

of data can be entered for the program to examine).

Step 7-Debounce time delay. Hex 20 is loaded into register 6.1. The register is decremented until R6.0 = 00.

ADDRESS	CODE	STEP	COMMENTS
0200	630F	1	V3=0F
02	6400		V4=00
04	6600		V6=00
06	6700		V7=00
08	A300		1=300
0A	F00A	2	VO=hex key digit (waits for any key pressed)
OC	0500		Do machine language routine at 0500
0E	F10A		V1= hex key digit
10	8011		Let V0=V0 logically ORed with V1
12	F055		Store VO in memory at 1, 1+1
14	7401		V4+01
16	3404		Skip if V4=04
18	120A		Go to 20A
1A	121C		Go to 21C (no-op)
10	A300	3	1=300
1E	F265		Let V0,V1,V2= memory at 1,1+1,1+2
20	650A	4	V5=0A
22	F029	7	Let I=display pattern for LSD of VO (LSDP)
24	D565		Show at V5,V6 coordinate
26	0540		Do machine language routine at 0540
28	6505		V5=05
2A	F029		Let I=V0 (LSDP)
2C	D5 65		Show at V5, V6
2E	6514	5	V5=14
30	F129	,	I=V1 (LSDP)
32	D5 65		Show at V5,V6
34	054D		Do mach. lang. routine at 054D
36	650F		V5=0F
38	F129		I=V1 (LSDP)
3A	D5 65		Show at V5, V6
3 C	7701	6	V7+01
3 E	4701		Skip if V7 not 01
40	1258		Go to 258
42	4702		Skip if V7 not 02
44	125E	-	Go to 25E
46	6500	. 7	V5=00
48	F229		I=V2 (LSDP)
4A	D565	_	Show at V5, V6
4C	E39E	8	Skip if V3=hex key LSD
4E	124C		Go to 24C
50	E3A1		Skip if V3 not equal hex key LSD
5 2	1250		Go to 250
54	00E0		erase display
56	1200	100	Go to 200
58	7606	9	V6+06
5A	A302		1=302
5 C	121E		Go to 21E
5E	7606	10	V6+06
60	050D		Do mach, lang, routine at 050D
62	A302		1=302
64	121E		Go to 21E
			Listing 3.



The screen with Listing 2 running. The circled area shows the hex character F1, which was entered from the keyboard.

Step 8-Program is at this step because an EF3=1 occurred. This is the right half of the byte being entered. Take memory at R5 and OR it with memory at RA to make up a full byte. Also decrement flip-flop register C.

One additional note on the Q latch: It is turned off in the refresh routine. This program will cause the Q audible tone to be long on the first half of the byte and short on the second half. This makes it convenient to be able to stay in step when entering data.

At this point you might say, "Now I have entered a byte of data. If it equals A1, the Q light will come on with a beep. So what?" That might be a valid question, but now we have laid the groundwork for other ma-

4D F8F1AF C RF=06F1 50 0FF6 M at RF→D, shift right	ADDRESS	CODE	STEP	COMMENTS
06	0500	F806BF	Α	RF=06F0
08 FEFEFE  08 5FD4  08 5FD4  00 F803BC  10 F800AC  13 EC  14 F800F6  17 4CBD  19 4CAD  10 F803BC  10 F800BC  10 F800BC  11 F800F6  11 F800F6  12 F800F6  13 F800F6  14 F800F6  15 F800BC  16 F800BC  17 4CBD  18 IC  19 4CAD  10 F80BC  10		F8F0AF		
0B	06	OFFE		Memory at RF→D, shift
0D F800AC 10 F800AC 11 F800AC 12 EC 14 F800F6 17 4CBD 18 CAD 19 4CAD 19 4CAD 10 F800AC 10 F800AC 11 F800F6 11 F800F6 12 F800F6 13 F800F6 14 F800F6 15 F800F6 16 F800F6 17 4CBD 18 CAD 1				
10 F800AC 13 EC		5FD4		
13 EC			D	RC=0300
14 F800F6 17 4CBD Memory at 300, operand 1 hi order+RD.1, RC+1 19 4CAD Memory at 301, operand 1 low order+RD.0, RC+1 18 1C RC+1 (now=303) 1C 8D RO.0+D (operand 1 low order 1D F4 Add mat RC +D 1E AD D+RD.0 (low order answer) 1F 2C RC-1 (now=302) 20 9D RD.1 (high order answer) 21 74 Add with carry, m at RC+D,D 22 BD D+RD.1 (high order answer) 23 5C D+m at RC, (store high order answer at 0302) 24 1C8D RC+1,D.0+D 26 5C RC+1,D.0+D 27 1C3B2E E RC+1 branch if DF=0 (test for carry out of high order answer at 0303 27 1C3B2E E RC+1 branch if DF=0 (test for carry out of high order answer at 0303 28 000000 29 REturn to CHIP-8 30 000000 31 000000 32 000000 33 000000 34 RETURN to CHIP-8 35 000000 36 RF=06F0 47 F8F0AF 48 F6F6F6 Mat RF+D, shift right four times 48 F6F6F6 LAB SFD4 49 F8F1AF C RF=06F1 40 F8F1AF C RF=06F1 41 Mat RF+D, shift right 42 RF=06F1 44 RF=06F1 45 RF=06F1 46 RF=06F1 47 RF=06F1 48 FF1AF C RF=06F1 49 RF=06F1 40 RETURN to CHIP-8 40 RT RF+D, shift right 40 RT RF=06F1 41 RETURN to CHIP-8 42 RF=06F1 43 RF=06F1 44 RT RF+D, shift right 45 RF=06F1 46 RF=06F1 47 RETURN to CHIP-8 48 RF=06F1 49 RT RF=00F1 40 RT				
17				
order+RD.1, RC+1  Memory at 301, operand 1 lo order+RD.0, RC+1  RC+1 (now=303)  RD.0+D (operand 1 low order  RD.0+D (low order answer)  RC+1 (now=302)  RC-1 (now=302)  RC-1 (now=302)  RD.1+D (operand 1 high order  RC+1 (now=302)  RD.1+D (operand 1 high order  RC-1 (now=302)  RC-1D (store high order  RC-1 (store high order  RC+1,D.0+D  RC+1,D.0+D				
19	17	4CBD		
18				
18	19	4CAD		Memory at 301, operand 1 low
1C 8D RD.0+D (operand 1 low order 1D F4 Add mat RC +D D+RD.0 (low order answer)  1F 2C RC-1 (now=302)  20 9D RD.1+D (operand 1 high orde 21 74 Add with carry, mat RC+D,D D+RD.1 (high order answer)  22 8D D-RD.1 (high order answer)  23 5C D+RD.1 (high order answer)  24 1C8D RC+1,D,0+D D+R at RC, (store high order answer at 0302)  26 5C D+RD.1 (high order answer)  27 1C3B2E E RC+1,D,0+D D+M at RC, (store low order answer at 0303  27 1C3B2E E RC+1 branch if DF=0 (test for carry out of high order M at RC (304)=01  2A F8015C M at RC (304)=01 Return to CHIP-8  2D D4 Return to CHIP-8  31 D4 Return to CHIP-8  32 000000  35 000000  40 F806BF B RF=06F0  43 F8F0AF 46 0FF6 M at RF+D, shift right four times  48 F6F6F6 J+RF=06F1  48 F6F6F6 M at RF+D, shift right  50 0FF6 M at RF+D, shift right				
1D F4 1E AD D+RD.0 (low order answer) 1F 2C RC-1 (now-302) 20 9D RD.1+D (operand 1 high orde 21 74 Add with carry, m at RC+D.D 22 BD D+RD.1 (high order answer) 23 5C D+m at RC, (store high orde 24 1C8D RC+1,D.0+D 26 5C D+m at RC, (store low order 27 1C3B2E E RC+1 branch if DF=0 (test 28 for carry out of high order 29 A F8015C Mat RC (304)=01 20 D4 Return to CHIP-8 21 E F8005C Mat RC (304)=00 22 RC+1,D.0+D 23 000000 35 000000 36 000000 37 000000 38 RF=06F6 Mat RC (304)=00 38 RF=06F0 49 F8F0AF 40 FF6 Mat RF+D, shift right 40 F806BF B RF=06F0 41 F8F1AF C RF=06F1 42 F8F1AF C RF=06F1 43 F8F1AF C RF=06F1 44 F8F1AF C RF=06F1 45 F8F1AF C RF=06F1 46 FF6 Mat RF+D, shift right 47 F8F1AF C RF=06F1 48 FFF6 Mat RF+D, shift right 49 F8F1AF C RF=06F1 40 F8F1AF C RF=06F1 40 F8F1AF C RF=06F1 41 Mat RF+D, shift right 42 F8F1AF C RF=06F1 43 F8F1AF C RF=06F1 44 RF+D, shift right 45 F8F1AF C RF=06F1 46 RF=06F1 47 Mat RF+D, shift right 48 F8F1AF C RF=06F1 49 Mat RF+D, shift right				
1E AD D-RD.0 (low order answer) 1F 2C RC-1 (now=302) 20 9D RD.1+D (operand 1 high orde 21 74 Add with carry, m at RC+D,D 22 BD D-RD.1 (high order answer) 23 5C D+m at RC, (store high orde				RD.0+D (operand 1 low order)
1F 2C				
20 9D RD.1+D (operand 1 high orde 21 74 Add with carry, m at RC+D,D 22 BD D+RD.1 (high order answer) 23 5C D+m at RC, (store high order answer at 0302) RC+1,D.0+D 26 5C D+m at RC, (store low order answer at 0303 RC+1,D.0+D 26 5C D+m at RC, (store low order answer at 0303 RC+1,D.0+D 27 1C3B2E E RC+1 branch if DF=0 (test for carry out of high order M at RC (304)=01 Return to CHIP-8 M at RC (304)=00 Return to CHIP-8 M at RF=06F0 FF M at RF=06F0 FF M at RF=0F0 FF M at RF+D, shift right FF FF FF M FF FF M AT RF+D, shift right FF M AT RF+D, shift right FF FF M AT RF+D, shift right				
21 74 22 BD D+RD.1 (high order answer) 23 5C D+m at RC, (store high order answer) 24 1C8D RC+1,D.0+D 26 5C P+m at RC, (store low order answer at 0302) 27 1C3B2E E RC+1 branch if DF=0 (test for carry out of high order A RC (304)=01 2A F8015C M at RC (304)=01 Return to CHIP-8 2E F8005C M at RC (304)=00 35 000000 35 000000 35 000000 36 RF=06F0 PF6 M at RF+D, shift right four times 48 F6F6F6 F6 M at RF+D, shift right four times 48 FD4 PF6F6 M at RF+D, shift right 48 F6F6F6 D+m at RF, return to CHIP-8 49 D+m at RF, return to CHIP-8 49 D+m at RF, return to CHIP-8 49 D+m at RF, return to CHIP-8 40 FF6 M at RF+D, shift right 41 F8F1AF C RF=06F1 42 D+m at RF, return to CHIP-8 43 D+m at RF+D, shift right 44 D+RF1AF C RF=06F1 45 D+m at RF+D, shift right 46 D+RF6 M at RF+D, shift right				
22 BD D→RD.1 (high order answer) 23 5C D→m at RC, (store high order answer at 0302) 24 1C8D RC+1,D.0+D 26 5C D→m at RC, (store low order answer at 0303) 27 1C3B2E E RC+1 branch if DF=0 (test for carry out of high order M at RC (304)=01 20 D4 Return to CHIP-8 21 000000 31 D4 Return to CHIP-8 32 000000 35 000000 36 000000 40 F806BF B RF=06F0 43 F8F0AF 46 0FF6 M at RF→D, shift right four times 48 F6F6F6 J M at RF→D, shift right 48 F6F6F6 J M AT RF→D, shift right 48 F6F6F6 J M AT RF→D, shift right 50 0FF6 M AT RF→D, shift right 48 F6F6F6 J M AT RF→D, shift right 48 F6F6F6 J M AT RF→D, shift right 48 F6F6F6 J M AT RF→D, shift right 49 F8F1AF C RF=06F1 M AT RF→D, shift right 40 F8F1AF C RF=06F1 M AT RF→D, shift right				
23 5C D→m at RC, (store high orde answer at 0302) 24 1C8D RC+1,0.0+D 26 5C D→m at RC, (store low order answer at 0303 27 1C3B2E E RC+1 branch if DF=0 (test for carry out of high order M at RC (304)=01 2D D4 Return to CHIP-8 2E F8005C M at RC (304)=00 31 D4 Return to CHIP-8 32 000000 35 000000 35 000000 40 F806BF B RF=06F0 43 F8F0AF 46 0FF6 M at RF+D, shift right four times 48 F6F6F6 John at RF, return to CHIP-8 48 FFD4 D→m at RF, return to CHIP-8 49 F8F1AF C RF=06F1 50 0FF6 M at RF+D, shift right				
answer at 0302) RC+1,D.0+D RC+1,D.0+D Pm at RC, (store low order answer at 0303 RC+1 branch if DF=0 (test for carry out of high order for carry out of high order At RC (504)=01 Return to CHIP-8 RETURN to CHIP-8 OU0000 RETURN to CHIP-8 RETURN t				
24 1C8D RC+1,D,0+D 26 5C D+m at RC, (store low order answer at 0303 27 1C3B2E E RC+1 branch if DF=0 (test for carry out of high order M at RC (304)=01 20 D4 Return to CHIP-8 2E F8005C M at RC (304)=00 31 D4 Return to CHIP-8 32 000000 35 000000 00 up to 540 36 P806BF B RF=06F0 47 F806BF B RF=06F0 48 F6F6F6 M at RF+D, shift right four times 48 F6F6F6 D+m at RF, return to CHIP-8 49 F8F1AF C RF=06F1 40 F8F1AF C RF=06F1 50 0FF6 M at RF→D, shift right	23	50		answer at 0302)
26 5C D→m at RC, (store low order answer at 0303  27 1C3B2E E RC+1 branch if DF=0 (test for carry out of high order Amat RC, (304)=01  2A F8015C Mat RC (304)=01  2D D4 Return to CHIP-8  2E F8005C Mat RC (304)=00  31 D4 Return to CHIP-8  32 000000  35 000000  40 F806BF B RF=06F0  43 F8F0AF Mat RF+D, shift right four times  46 0FF6 Mat RF+D, shift right four times  48 5FD4 D→m at RF, return to CHIP-8  49 F8F1AF C RF=06F1  50 0FF6 Mat RF→D, shift right  40 F81AF C RF=06F1  40 F8F1AF C RF=06F1	24	1000		
answer at 0303  RC+1 branch if DF=0 (test for carry out of high order for carry out of high order M at RC (304)=01  D4 Return to CHIP-8  E F8005C M at RC (304)=00  T Return to CHIP-8  O00000 O0000  M at RC (304)=00  Return to CHIP-8  Return to CHIP-8  Return to CHIP-8  F800000 O0 up to 540  M at RF+0F6  M at RF+D, shift right four times  F8F0AF F8F1AF C RF=06F1  M at RF+D, shift right  F8F1AF C RF=06F1  M at RF+D, shift right  RF=06F1  M at RF+D, shift right  RF=06F1  M at RF+D, shift right				
27 1C3B2E E RC+1 branch if DF=0 (test for carry out of high order M at RC (304)=01 2D D4 Return to CHIP=8 2E F8005C M at RC (304)=00 31 D4 Return to CHIP=8 32 000000 35 000000 00 up to 540 35 000000 40 F806BF B RF=06F0 43 F8F0AF 46 0FF6 M at RF+D, shift right four times 48 F6F6F6 D+m at RF, return to CHIP=8 48 F5F04 RF=06F1 49 F8F1AF C RF=06F1 50 0FF6 M at RF→D, shift right	20	,,		
F8015C	27	1C3B2F	F	
2A F8015C Mat RC (304)=01 2D D4 Return to CHIP-8 2E F8005C Mat RC (304)=00 31 D4 Return to CHIP-8 32 000000 35 000000 00 up to 540 38 000000 40 F806BF B RF=06F0 43 F8F0AF 46 0FF6 Mat RF→D, shift right 48 F6F6F6 four times 48 5FD4 D→m at RF, return to CHIP-8 4B 5FD4 F8F1AF C RF=06F1 50 0FF6 Mat RF→D, shift right		20,022	-	
2D D4 Return to CHIP-8 2E F8005C M at RC (304)=00 31 D4 Return to CHIP-8 32 000000 35 000000 00 up to 540 36 000000  40 F806BF B RF=06F0 43 F8F0AF 46 0FF6 M at RF→D, shift right 48 F6F6F6 four times 48 5FD4 D→m at RF, return to CHIP-8 49 F8F1AF C RF=06F1 50 0FF6 M at RF→D, shift right	2A	F8015C		
31 D4 Return to CHIP-8 32 000000 35 000000 38 000000  40 F806BF B RF=06F0 43 F8F0AF 46 0FF6 M at RF→D, shift right 48 F6F6F6 four times 48 5FD4 D→m at RF, return to CHIP-8 4D F8F1AF C RF=06F1 50 0FF6 M at RF→D, shift right				
32 000000 35 000000 40 F806BF B RF=06F0 43 F8F0AF 46 0FF6 Mat RF→D, shift right 48 F6F6F6 four times 48 5FD4 D→m at RF, return to CHIP-8 40 F8F1AF C RF=06F1 50 0FF6 Mat RF→D, shift right	2E	F8005C		M at RC (304)=00
35 000000 00 up to 540 38 000000  40 F806BF B RF=06F0 43 F8F0AF 46 0FF6 Mat RF→D, shift right 48 F6F6F6 four times 48 5FD4 D→m at RF, return to CHIP-8 4D F8F1AF C RF=06F1 50 0FF6 Mat RF→D, shift right	31	D4		Return to CHIP-8
38 000000 40 F806BF B RF=06F0 43 F8F0AF 46 0FF6 M at RF→D, shift right 48 F6F6F6 four times 48 5FD4 D→m at RF, return to CHIP-8 4D F8F1AF C RF=06F1 50 0FF6 M at RF→D, shift right		000000		
40 F806BF B RF=06F0 43 F8F0AF 46 0FF6 Mat RF→D, shift right 48 F6F6F6 four times 4B 5FD4 D→m at RF, return to CHIP-8 4D F8F1AF C RF=06F1 50 0FF6 Mat RF→D, shift right	35	000000		00 up to 540
43 F8F0AF 46 OFF6 Mat RF→D, shift right 48 F6F6F6 four times 48 5FD4 D→m at RF, return to CHIP-8 4D F8F1AF C RF=06F1 50 OFF6 Mat RF→D, shift right	38	000000		
43 F8F0AF 46 OFF6 Mat RF→D, shift right 48 F6F6F6 four times 48 5FD4 D→m at RF, return to CHIP-8 4D F8F1AF C RF=06F1 50 OFF6 Mat RF→D, shift right	40	F806BF	В	RF=06F0
46				
48 F6F6F6 four times 4B 5FD4 D→m at RF, return to CHIP-8 4D F8F1AF C RF=06F1 50 0FF6 M at RF→D, shift right				M at RF→D, shift right
4B 5FD4 D→m at RF, return to CHIP-8 4D F8FIAF C RF=06F1 50 0FF6 M at RF→D, shift right				
4D F8F1AF C RF=06F1 50 0FF6 M at RF→D, shift right				D→m at RF, return to CHIP-8
50 OFF6 M at RF→D, shift right			С	
				M at RF→D, shift right
	5 2	FEFEFE		four times
55 5FD4 D→m at RF, return to CHIP-8	55	5FD4		D→m at RF, return to CHIP-8

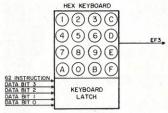


Fig. 1. Keyboard operation. A 62 instruction causes the least significant four bits of the memory byte pointed to by register X to be latched in the keyboard latch. Only the hex key representing those four bits will generate an EF3 = 1 when pressed. The normal programming technique is to scan each hex digit into the latch and then check for an EF3 = 1 to tell which key has been pressed.

chine-language programs to build on.

We now have a subroutine that could be used with any Elf-2 program, for instance. We are now able to input variables to a program when needed. If you look carefully at position 00E0 on the screen, you will see the character entered. This is one way of outputting data, although I must admit it is a bit crude.

A more sophisticated method of inputting and outputting data is to use a combination of CHIP-8 language with machine-language subroutines. The

CHIP-8 language combined with the display patterns stored in the 512 byte ROM do a nice job of displaying numbers on the screen. The programs in Listings 3 and 4 (the CHIP-8 and machine language, respectively) show the two languages combined. These programs use CHIP-8 for input and output, with machine-language shift and addition subroutines.

The main purpose of these programs is to demonstrate the technique of interfacing CHIP-8 to machine language when there is a desired function that cannot be programmed in CHIP-8 alone. It is also useful if you are new at working the hexadecimal.

Try keying in some hex numbers and observe how hex addition works. The addition routine is an adaption of the routine published in *Kilobaud Microcomputing*, March 1979 ("Programming the 1802," p. 122). That article was written with the Elf-2 in mind. These programs show how Elf-2 programs can be adapted to the VIP. The program in Listing 3 works as follows:

Step 1-Initialize variables.

Step 2—Accept four bytes from the keyboard and store in memory locations 300,301,302, 303.

Step 3—Load memory bytes 300,301,302 in variables 0,1 and

### Variable Allocation

- V 0 Most significant data buffer and keyboard entry
- V 1 Least significant data buffer and keyboard entry
- V 2 Carry position data buffer
- V 3 Keyboard character for compare
- V 4 Counter for keyboard entry
- V 5 X display position (horizontal)
- V 6 Y display position (vertical)
- V 7 Counter for repeat of display routine

### **Memory Allocation**

0300	Operand 1 high order byte
0301	Operand 1 low order byte
0302	Operand 2 high order byte
0303	Operand 2 low order byte
0304	Carry byte
0302	Answer high order byte
0303	Answer low order byte

Note: The answer is overlayed into memory locations 0302 and 0303 after operand 1 and 2 have been displayed.

Table 1.

Step 4—Set display position. Display variable 0 twice-first the least significant digit, then the most significant digit.

Step 5—Set display position. Display variable 1 twice-first the least significant digit, then the most significant digit.

Step 6-Decision step. First,

second or third time at this point. 1st-Have just displayed operand 1, branch to step 9. 2nd-Have just displayed operand 2, branch to step 10. 3rd-Have just displayed answer, go to step 7.

Step 7—Set display position. Display variable 2 (contains carry indication-00 or 01).

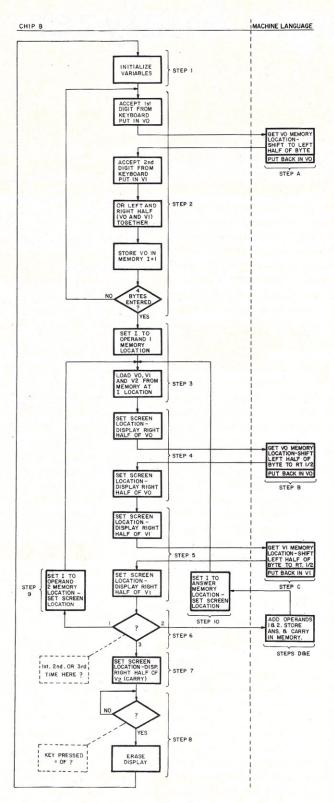


Fig. 2.

Step 8-Check for keyboard = 0F. If key = 0F, wait until it is released. Erase screen. Go to step 1.

Step 9-Set display position and I to display operand 2. Branch to second part of step 3.

Step 10-Set display position. Branch to add subroutine. Set I to display answer. Branch to second part of step 3.

### Machine-Language Steps

Step A-Get variable 0 stored at memory location 06F0. Shift left four times. Put back in 06F0 location.

Step B-Get variable 0 stored at memory location 06F0. Shift right four times. Put back in 06F0 location.

Step C-Get variable 1 stored in memory location 06F1. Shift right four times. Put back in 06F1 location.

Step D—Add subroutine. The program listing is fairly self-explanatory. For a more detailed explanation see "Programming the 1802." This routine is an adaptation of a routine in that article.

Step E-Check for carry (DF = 1). Store 01 for a carry indication at memory location 0304. Store 00 for a no carry indication.

### Conclusion

The program flowchart in Fig. 2 and the memory and variable usage in Table 1 should allow you to follow along with the program. Some shifting is necessary when working with CHIP-8 variables. The keyboard entry and display routines in CHIP-8 will only input and output the least significant half of the byte. The method I used is to go to the memory location the variable is stored in and manipulate it so the least significant half of the byte has the correct data in it. The CHIP-8 program doesn't know the difference.

Well, there you have it. I hope some of these ideas and techniques will be useful for other COSMAC VIP owners.

### COMPUTER **EQUIPMENT** & SOFTWARE **BARGAINS**



### **EVERY MONTH**

BUY, SELL OR TRADE ALL TYPES OF COMPUTER EQUIPMENT AND SOFTWARE (pre-owned and new) among 20,000 readers nationwide. FEATURES:

- Low classified ad rates 10¢ a word
- Hundreds of ads from individuals
- Categorized ads so you can find them instantly
- Large (11 by 14") easy to read pages

Subscribe now for \$10 and receive 13 issues/year (one FREE plus 12 regular issues). After receiving your first issue if you're not completely satisfied you may have a 100% refund and you still keep the first issue free. Bank cards accepted.

BONUS: If you have something to advertise (preowned or software) send in a classified ad with your subscription and we'll run it FREE.



P.O. BOX F 21 • TITUSVILLE, FL 32780 • 305-269-3211

MasterCharge or VISA orders only, call TOLL FREE 800-327-9920.

### Poor Man's Logic Analyzer

### Troubleshooting needn't be a rich man's sport.

Scott B. Eckert 113 Roxboro Circle, Apt. 6 Syracuse, NY 13211

hen I had completed enough of my home-brew computer system to warrant power on, I was sadly disappointed. It didn't work! My home-brew design is based on the 6502 microprocessor and the 6530-004 multipurpose chip. One of the 6530-004's purposes is to provide a 1K ROM monitor program called TIM (Terminal Interface Monitor). Since it also provides a serial I/O port, I had no front panel controls except for power and reset. Well, I tried reset and got no response-so I was in trouble.

### Background

Let me explain how TIM communicates with the outside world. When reset is pushed, the 6502 processor wants to go to locations FFFC/FFFD to get the

two bytes present there. It then interprets these two bytes as a sixteen bit address to which to go and begin executing code as part of the reset initialization program for the particular system in which it is used.

However, logic on my 6530-004 board detects this reset and FFFC/FFFD condition and makes the processor fetch the bytes from 73FC/73FD instead. These two bytes are in the end of the ROM (TIM is reguired to reside in locations 7000-73FF) and point to the reset routine that is in the lower part of the ROM.

This reset program does the housekeeping chores required for proper system operation, i.e., it initializes the I/O port, initializes the interrupt vectors, sets up the stack pointer, etc. In addition, this routine waits for a carriage return from the keyboard and determines the baud rate at which the serial data is being transmitted.

Anytime you wish to change

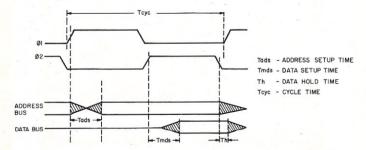


Fig. 1. Clock signals and various important times on a 6502 microprocessor.

baud rates, you simply press reset and hit a carriage return. The routine stores this baud rate constant for use whenever an output routine is called. After all this and more, TIM is nice enough to print all the register contents and wait for a command (when it is working properly).

### The Problem

I knew the processor was doing something in ROM because the chip-select line on the chip was being enabled, but I had no idea what the processor was doing or where it was in ROM. From the address lines, I could determine that it was looping somewhere in the ROM. I had a listing of the TIM program, but that didn't help me at this stage of the game. It is difficult to decipher sixteen address lines simultaneously with a single trace, "trigger-sometimes" scope. Worse, I had to know if the correct data was being sent down the data bus from the ROM itself.

Well, I wished at that point that I knew somebody with one those fancy analyzers. . . you know, the ones that cost hundreds to thousands of dollars! I then decided to build the poor man's logic analyzer-something that would allow me to specify the address that I want it to, grab the data off the data bus and display it to me out in the real

world. As you will see shortly, this turns out to be a fairly easy task, really nothing more than a souped-up parallel I/O port!

### The Circuit Details

The DIP switches set the address desired to be the trigger address. Each group of four switches goes to the input of one of the 74LS85 4-bit magnitude comparators. The address line corresponding to each switch is also tied to the proper input on the 74LS85. When the proper address is on the address bus (the address that matches that set into the DIP switches), the A = B output of each comparator drives the cascading A = B input of the following comparator. If all are enabled, the output from U4-6 will enable the 3 input NAND gate U6-2.

If the arm switch has been pressed and flip-flop U5 is set, the rising edge of the 02 clock pulse will cause the output of U6A-12 to go low until one of the inputs to it goes low again. Since the address in a 6502 system is valid shortly after 01, the level on U6-2 is high well before 02 comes along (see Fig. 1).

When 02 goes high, the negative-going signal from U6A-12 is inverted again by U6B and used to enable the 7475 quadlatches. The negative-going edge at pin 12 of U6A also triggers U10, a one-shot multivibrator with approximately a 1

second pulse width. This drives an LED to show that the circuit has been triggered by the occurrence of the address set into the switches.

When 02 returns low again, pin 12 of U6A goes high. This positive-going edge toggles flipflop U5, if the analyzer is in the single-shot mode, or does not toggle it if in the continuous mode of operation. In the singleshot mode, the circuit is locked out from further triggers until the arm switch is momentarily moved to the continuous position in order to set the flip-flop. When set to the continuous mode, it can be used as a standard latched parallel I/O port with LEDs, but it can also be easily moved to any address in memory.

### Some Timing Details

I think a word is in order here regarding the timing considerations of this circuit to help adapt this circuit to non-6502 systems. First, the address becomes valid about 200 nsec after 01 goes high. The data bus is floated during this period on a 6502, so there is nothing on the data bus to grab yet.

Data becomes valid approximately 150-200 nsec after 02 goes high for a write cycle and must be valid for a minimum of 100 nsec before 02 goes low for a read cycle. These times are given for a 1 MHz clock, each phase being about 500 nsec. This allows plenty of time for the data to be at the 7475's inputs and meet the data set-up time of 20 nsec. (Data set-up time is defined as the time required for the data to be present at the input terminals before trying to latch it in.)

When the 02 clock goes low, this is the most critical part of the whole operation. The data from a 6502 is valid for approximately 10-30 nsec after the 02 clock phase goes low. With the two gate delays from the 74LS10 totaling 20-30 nsec, it appears questionable whether the circuit will work. However, the typical delay of a 74LS10 is about 10 nsec, and the typical valid data time is 30 nsec, so every 74LS10 that I tried worked perfectly.

I suppose this stems partly

from the fact that most devices are rated conservatively, and, of course, assuming you don't buy junk. You could always go to a 74H10 version of the gate, which has only a 6 nsec typical gate

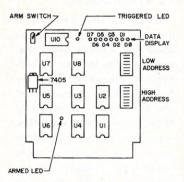


Fig. 3. Integrated circuit and LED layout. Resistors were placed on end between IC packages to conserve space.

Part	Qty.	Price ea.	Total	
Radio Shack Board	1	\$3.50	\$3.50	
# 276-154		40.00	40.00	
74LS85	4	1.00	4.00	
7474	1	.35	.35	
7475	2	.50	1.00	
74LS10	1	.25	.25	
74121	1	.35	.35	
7805	1	1.25	1.25	
8-pos DIP switch	2	2.25	4.50	
LED	1.0	.20	2.00	
10k Resistor 1/4 W	17	.05	.85	
1k Resistor 1/4 W	10	.05	.50	
100 uF 16 V Elect	1	.20	.20	
Switch, Toggle SPST	1	2.00	2.00	
.01 Disk caps	,4	.05	.20	
			\$20.95	

Table 1. Parts list. The entire circuit was constructed on a Radio Shack experimenter board with the standard 44-pin edge connector. The total price can be reduced if you have a well-stocked junk box.

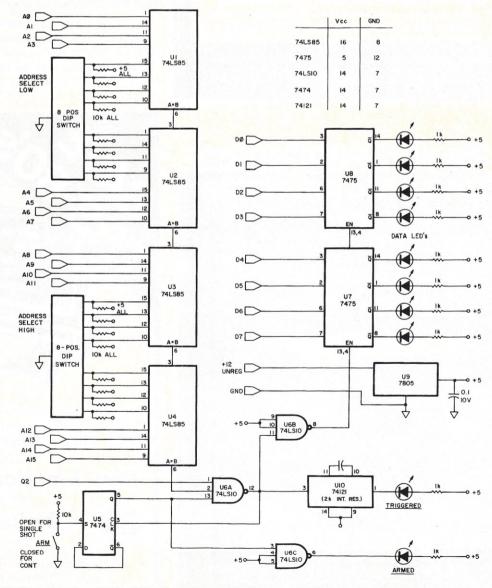


Fig. 2. Logic diagram of the poor man's logic analyzer.

### THE BEST IN SOFTWARE FROM COMPLEAT SYSTEMS

### NON-PROFIT/SERVICE INDUSTRY ACCOUNTING

For TRS-80 and CPM. In use over 2 yrs. A partner of a big 8 acct firm said "... the best accounting program I have seen ... does in a few pages what is frequently not done in 50 . . ." Unique features include:

- -Twice as fast as other systems
- Common sense accounting-no debits or credits
- Budgets, prior year, and year-to-date
- Current status available at all times
- -8 separate Funds or Co's allowed
- over 2000 accounts allowed
- standard 8½ x 11 output
- one year free update service

Min. system 2 disk, 32K TRS-80 or 1 disk, 48K Z-80 CP/M \$695/\$35 manual. Complete systems also available. Payroll avail. Aug. 80: A/R, A/P, 8080 ver. avail. soon.

### **SECURITY FOR TRS-80 AND CPM**

The best security system available. Automatically encodes/decodes all data to/from disk. A billion billion (1018) combinations. Typical uses include: proprietary, sales, financial, tax, or confidential client information; and time sharing/multi user systems such as Source, Micronet, etc.

\$49.95 Min. systems 1 disk, 16K, TRS-80 or 24K CP/M.

\$500 FREE to first to decode our sample message.

COMPLEAT SYSTEMS 9551 Casaba Ave. Chatsworth, CA 91311 213-993-1479

Master Charge and VISA accepted. CA residents add 6% tax. TRS-80 and CPM are registered trademarks of Tandy Corp and Digital Research

delay. I did not try one, but that would probably guarantee success (if that's possible), although I doubt you'll have any trouble with the circuit as shown.

### For My Next Project

As far as enhancements to the current design, I believe you could build a similar circuit that would provide for, say, 16 consecutive addresses once the trigger address is recognized and store them in a couple of 7489s, which are 16 x 4 RAMs. Also, if you wanted to spend the money, you could buy those hexadecimal displays with the latch and decoding all in one package. These would make for a nice display, but would increase the cost of the project significantly.

### Did I Get My System Running?

If you are wondering whether or not I got my system running with the help of this analyzer, the answer is yes! I set the address trigger to an address in

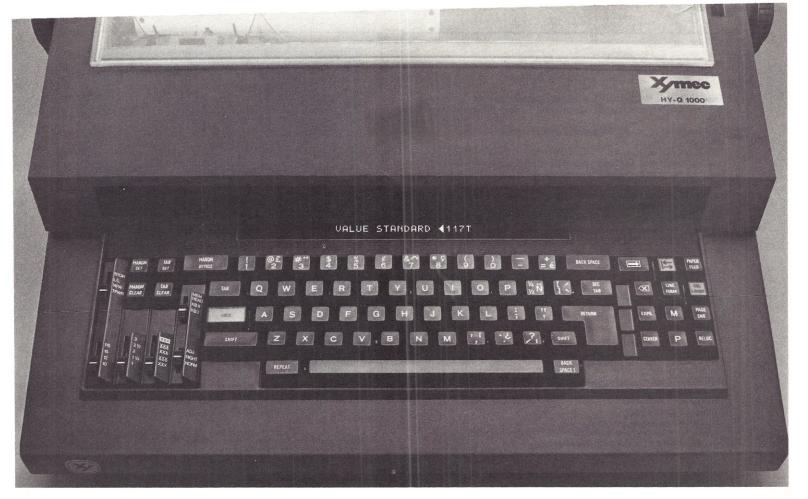
the section of the monitor that was supposed to run each time a reset was pressed. I checked that the program actually passed through that point, as well as if the data from the ROM was correct.

I continued this until I found the problem area to be the baud rate measuring routine. I checked the baud rate generator board I had built and found it was putting out a 1200 baud rate even though I had it set for 600 baud. This was evidently too high for the TIM program to properly read. I corrected the problem on the baud rate board, set it to 600 baud, pressed reset, and it printed all my register contents and sat waiting for my command.

I can attribute my success to my poor man's logic analyzer. I'm sure I would have found the problem eventually, but I'm also sure it saved me a lot of valuable time... much better spent trying to devise ways to improve my system, not merely getting it to work!







# Now... Intelligence beyond your CRT

### HY-0 1000

Xymec's HY-Q 1000™ Series brings microprocessor capability to printing. This fast, letter quality, intelligent printer/typewriter expands the capability of your computer or word processing system.

Xymec gives your system more of the features you want most:

- L.E.D. display
- tractor feed
- RS232, IEEE-C779 interface

Compatible with nearly all microcomputers, the HY-Q 1000™ Series prints **boldface** and **reverse**, centers titles, sets columns and right justifies. Your choice of three pitches and proportional spacing, with minimum throughput print speed of 20 cps. Changing print wheels or type styles takes but seconds. Intelligent printing makes good sense to me: Send me more information and the name of my local dealer.

Xymec, Inc. 17905 Sky Park Circle, Suite J Irvine, CA 92714

Telephone -



Xymec gives you more features than any other machine on the market, regardless of price!

Xymec intelligent printers won't create a service nightmare. Reliably constructed, the HY-Q 1000™ Series is built with serviceability in mind. And with service centers nationwide, maintenance is easy and convenient.

Give your computer system the intelligent edge. Join up with Xymec. For more information, send in this coupon today.

Xymec, Inc.
Subsidiary of Litronic Industries
17905 Sky Park Circle, Suite J
Irvine, CA 92714 (714) 557-8501

### Client Write-Up System\*

The Client Write-Up System allows for the quick preparation of financial records (General Ledger, Balance sheet, Income Statement) for a client.

One time entry of general ledger and payroll accumulation by employee.

Calculates and accrues employer taxes for Social Security, Federal and State U/C taxes. User furnishes the taxable wages and rates and the computer sets up the liability and expense.

Allows up to ten repetitive entries for depreciation and amortization of prepaid expenses, which are entered into the Client Master File and automatically updated monthly.

General ledger account and employee names are displayed when keyed by the user.

Can consolidate individual master files into one profit and loss statement, and one balance sheet.

All constants such as tax rates, taxable wages, etc. are user furnished in the Client Master file.

#### Reports

Balance Sheet

Comparative I/S and B/S Trial Balance 941. W-2 General Ledger Income Statement \$1500.00

### Time Analysis System\*

Accurate accounting of the billing of time and services rendered is the goal of the Time Analysis System (TAS).

Activity file can be custom tailored by the organization to fit individual business applications.

Employee time is categorized into different activities.

Activities are entered into the client file and reflect the activity performed, and the time spent by the employee.

Rates are assigned to each employee and are used to bill the employee's time.

Rate and activity amounts to be billed are computed and maintained as a Work-In-Progress amount.

All or part of the Work-In-Progress amount is transferred into an accounts receivable amount at the end of the month.

Statements are printed reflecting the accounts receivable amount owed by the clients.

### Reports

Activity File Client Activity Ledger Employee File Statements \$200.00 Employee Activity Report Client File

### Asset Depreciation System\*

The goal of the Asset Depreciation System (ADS) is to keep accurate records of a client's assets and subsequent depreciations. Depreciation of a given asset is computed by one of five standard methods: Straight Line, Sum-of-the-Year's-Digits, Double Declining Balance, 1.50 Declining Balance, and 1.25 Declining Balance. Dates used with the purchase of the asset are rounded to the nearest month start.

An asset, at the end of useful life, is terminated by one of four methods of disposal.

ADS houses a general ledger chart of accounts so that the accountant's own general ledger may be easily cross-referenced with the

The asset cost and accumulated depreciations are grouped by the ADS general ledger.

### Reports

MOD IIw/ 64K RAM

132 Column Line Printer

Fixed Asset Ledger COA listing Equipment File Listing Asset Depreciation \$200.00 Schedule \* Hardware Requirements

HNCT The Complete 23. Computer Company

MOD I w/ 32K RAM

3 5¼" Disk Drives

Houston Micro-Computer Technologies, Inc. 5313 Bissonnet Bellaire, Texas 77401 713/661-2205



### Have computer, will travel. Executive Computer System Carrying Cases.

- Makes your microcomputer truly portable.
  Protects your equipment: locking latches limit access.
  Rugged black vinyl with metal corners outside.
  Protective foam rubber, black velveteen covered, inside.
  Computer can be operated without removing from case.
- And cases are custom designed for full systems.

#### Apple\* Executive Case holds:

- Apple microcomputer.
- 9" Sanyo monitor. 2 disk drives.
- Power strip. 2 boxes diskettes.
- 2 boxes diskettes.
  Manuals.
  Dimensions: 28" x 21" x 10½".
  Weight: 17 pounds.
  Price: \$179

- TRS-80\*\* Executive Case holds:
- TRS-80 Microcomputer.
- Expansion interface.
  2 disk drives.
  Power strip.
  2 boxes diskettes.

- · Manuals.
- Dimensions: 28" x 21½ " x 8½ ".
- Weight: 17 pounds.
- Price: \$179

Terms: FOB Los Angeles — Master Charge, Visa or check with order. Allow 3-4 weeks for delivery.

- \*Registered, Apple Computers, Inc. \*\*Registered Trademark, Tandy Corporation.

### **COMPUTER TEXTile**

10960 Wilshire Blvd, Suite 1504 Los Angeles, CA 90024

(213) 477-2196

"TRS-80 is a registered trademark of TANDY CORP."

Call about our fantastic price on

4-drive complete system. Level II 4K \$557.10

Level II 16K \$720.00 Expansion Interface \$269.00 \$403.20

Expansion Interface 16K Expansion Interface 32K \$524.00 16K Memory Kit for TRS-80 or Apple



### TRS-80 & NORTH STAR ADD-ON DRIVES

### CUSTOM **ENCLOSURE**



### CABLE INCLUDED

Single drive system in custom enclosure		
Single drive system in metal enclosure\$	375.00	
Double drive system in custom enclosure	806.00	
MPI	275.00	•
MPI, B52, dual headed\$	349.00	
Shugart SA400	275.00	
Shugart \$4800	479 00	

Tandom double sided......\$425.00 
 Hazeltine 1000
 \$450.00

 Single tier walnut enclosure for Shugart
 \$ 35.00
 Double tier walnut enclosure for Shugart......\$ 52.00 Atori 400. \$548.49 Atori 800. \$795.00 
 Hazeltine 1410
 \$749.00

 Centronics PI Printer (TRS-80 add on)
 \$398.95
 Centronics 779-2 tractor (TRS-80 add on)......\$1049.95 TI Printer.....\$1599.00 Base 2......\$649.00 Horizon 1, 32K.....\$2290.00 Televideo 912.....\$775.00

SPECIAL! MINI FLOPPY DISKS, box of 10 (with plastic box) only \$28.00 (without plastic box) only \$26.50. Box of 10. 8" disks (in plastic box \$30.00). Centronic 779 ribbons \$3.50 each.



29-02 23rd Ave., Astoria, N.Y. 11105 TWX 7105822107 (212) 728-5252 (800) 221-1340

### **WORDPRO 3 USERS**

Save Time — Personalize Letters

Announcing a USABLE MAIL LIST PROGRAM which lets you make multiple copies of the same letter yet address it to different customers. Designed to interact with Commodore's new Wordpro 3 or 4, this program creates the files for variable text eliminating the necessity to run the letter through twice to give it that personalized effect. For the 40 or 80 column PET, random or relative files - please specify which.

Can pay for itself with one use at a minimum investment of \$100.00.

For further details contact:

### Micro Computer -167 Industries, Ltd.

1520 E. Mulberry, Suite 240 Fort Collins, Co. 80524 (303) 221~1955

### Dear Subscriber:

Kilobaud Microcomputing does not keep the subscription records on the premises, therefore, calling the Peterborough offices doesn't solve your subscription problem.

To quickly solve your problem please send your most recent address label and a description of the problem to:

> **Kilobaud Microcomputing Subscription Department** PO Box 997 Farmingdale, NY 11737

Please allow the subscription department at least two weeks for an answer or a solution to your prob-

Thank you and enjoy your subscription.

Sincerely,

Debra L. Boudrieau Circulation Manager

Just imagine; an IBM Model 725 "SELECTRIC" typewriter built into a complete table-top RS-232 terminal! These surplus terminals were formerly on lease and appear to be in good condition (we test 'em to make sure the printer is functional!) These fantastic BCD-Coded terminals feature:

•134.5 BAUD I/O

•88 Character Set

•6 Bit BCD CODE

Attractive Case

- •15" CARRIAGE
- •725 'SELECTRIC' • RS-232 1/0
- •132 COLUMNS
- Sim. to IBM 2741
- Std. Typewriter Kbd.
- MAX: 15 CPS RATE
- •10 Chars./Inch
- Removeable Type Sphere

ONLY

•Upper/Lower SHIFT

\$46900

While we will check out each unit, we MUST offer these unique bargains "AS-IS": Meaning they may need some service but are basically operational. Add \$20.00 for packing crate, you pay shipping on delivery.

ALSO INCLUDES: Type ball, I/O circuit boards, power supply & some data. Sorry, no power

### -SPECIAL OFFER!!-

Buy 2, take 20% Off the Full Price-

NEWTON NH 03858

2 for \$75000

### "SELECTRIC"\* PRINTER MAINTAINANCE MANUAL



Associates, Inc.

### APPLE -

the graphics & games people

New! Super Starbase Gunner

\$19.95 DISK



\$19.95 DISK

Most shoot-em-up target games are 2-D shoot across the screen type, and quite frankly there is a glut of inferior ones. A need for a new approach exists, such as fast 3-D HIRES simulations with clever and complex challenges. How about shooting into the screen, into 3-D space, where the target is mathematically many feet behind the screen surface? How about computer intelligent targets that shoot back and use strategy and learn? How about all this and the best attributes of the more popular games? Let's include high score, 10 levels of play, snappy sound effects, colorful explosions and real time graphics. Why not go all the way and have a three dimensional gunsight? A real space battle simulation . . . Nah . . . no one would believe it or could even write it. Right?
WRONG!! WE HAVE IT . a . and it is SUPER STARBASE GUNNER. We are very excited about this product because it is all the things we wish we had and didn't. And you can have it now with this introductory offer.

SUPER STARBASE GUNNER DISK...\$19.95 48K with APPLESOFT ROM

AVAILABLE FROM YOUR DEALER OR DIRECT FROM APPLE - JACK, BOX 51, CHERRY VALLEY, MA 01611 (INQUIRIES INVITED)

### A Humanist's Approach To Computer Programming

You can tell a lot about a person by the programs he writes.

Dick Lutz 4802 Fifth Avenue Pittsburgh PA 15213

of this article might be "A Computerist's Approach to Human Programming." That is, the intention is to program you. the writer of computer programs for the use and enjoyment of yourself and others, so that what you prepare to run on your computer will also run effectively in your mind-and in mine should I have the occasion to read one of your programs (or worse, attempt to debug it).

"What," you may ask, "is the percentage in this idea?" Why should you write programs so that I can read them? Simply because unless you've never written anything more complicated than a counting program, you've probably had the experience of trying to figure out what in the world you were trying to do in one section or another of one of your programs. Surely you've puzzled over somebody else's poorly annotated program, wondering what in the world he had in mind.

Is this a plea for documentation? In part, yes. It's time to start writing programs for people to read—not just machines. My reasoning is that if you write REMarks good enough to help you understand your program later, there's at least a fighting chance that if I encounter it, I'll

eventually be able to untie the knot it'll put in my feeble cranium.

But there's even more to it. As computerists, we're on or near the leading edge of something that will become more and more widespread in our society-the use of electronic computers to lighten the load and enlighten life. That makes it particularly important that we computerists think like humanists in writing programs...simply because more and more people are going to be trying to read them.

The exact approach is not important-only that there be a logical (humanly logical, please) consistency to what you're doing, so that others can pick up and read your style. Rather than lecture about how to proceed, let me tell you how I go about it, and you can adapt my procedures to those you've already worked out for yourself.

### **PRGMBASE**

I keep PRGMBASE handy. It's reproduced here. I load it whenever I begin writing a program in Microsoft BASIC. It not only imposes form on what I write, but it also helps me as I

### **Program Writing Utilities**

In lines 0-9, you'll find some utility items specifically written for my hardware configuration. By typing RUN/cr, I call line 1 into action. It alternately expands or contracts my Imsai VIOC video output. This is convenient

because on my fussbudget monitor, the 24 x 80 format occasionally leaves doubt as to whether I'm looking at 0, 8, 2 or 5, all of which can look alike at the screen's edges.

Line 3 toggles video in and out of the wraparound mode, so RUN 3/cr gives me scrolling whenever I need it. The 0-9 portion of PRGMBASE is selected for this duty because it simplifies repeated call-up while writing programs. These utilities could as well be in the 65000 zone, except that it would take more typing ("RUN 65302/cr") for each use.

Of course, once a program is wriften and I have no further use for these utilities, I just DELETE 0-10 before a final SAVE. But there's more.

### **Automatic Variable Index**

Ever lose track of a variable? It can be maddening to work for hours to debug a recalcitrant program, only to discover that you've used variable CH as both CHart and as CHange, and maybe even as CHoice. With three potentially overlapping assignments, your program is sure to stumble on a variable sooner or later. I've made this mistake so often that I now keep track of my variables as I go along, using the variables index built into lines 7000-9700 of PRGMBASE.

It's very easy, once you get used to it. A variety of methods are possible, but what works for me is to take a hard-copy listing of lines 7000-9700 as I begin.

Then I can see at a glance that the K variables are indexed at 8100, and that variable KS would be indexed at 8100 + 19, S being the 19th letter of the alphabet. Since I don't remember that S is letter #19, line 8900 reminds me.

When I'm about to use a new variable, I determine what its number would be in the index-but before I write the index line for it, I LIST it. If it comes up blank, I know I'm in the clear. If not, I've saved myself some excruciating debugging. And through the process of saving the variables in this index, I've helped myself and others to decipher what my program is supposed to be doing.

If it's carefully planned, the variable index itself can be used to initialize variables, set default values and to DIMension arrays (see lines 8717, 8726 for examples). And as a final bonus, this simplifies the DEFINT process at the end of program writing, since a glance at a section will tell you immediately if all R (or S, or B) variables are in-

Incidentally, you'll notice in the index that LN is a reserved variable, which means LiNe (number). When I'm writing a program section that later might give me trouble-or if I'm fretting over one that is already giving me fits - I just insert an extra line: LN = (current line number). Then I add the following line to my utilities in the 0-9 section: 4 PRINT "BUGSPRAY NEEDED LINE"; LN;

:RETURN

By inserting GOSUB4 where I suspect a program is running amok, I get a readout of where my problem may be. Again, there is a variety of approaches to this idea, and you can impose your own method to make it work best for you.

### **Program Index**

PRGMBASE also provides a program index, which simplifies the work of somebody trying to figure out what the program is intended to do, as well as helping me organize myself while writing a program. So that I don't spend a lot of time figuring out where to index a program section, there's a simple formula in the program for deriving the index location from the program line number, or vice versa:

INDEX – (PROGRAMLINE/100) + 10000 or, in human terms, drop the last two digits from the program line number and add 10 to the left of what remains. Program line 25500 becomes index location 10255. In reverse, it's just a matter of dropping the 10 from the head of the index number and adding 00 at the end of the result. Thus, index location 10025 refers to program line (0)2500.

### **Program Structure**

In a further sense, the way I write programs in itself amounts to an index. That kind of program structuring is shown in PRGMBASE in lines 10860 and up. Once more, this is not just useful to the poor schlemiel who may have to figure out what I've written, but to me while I'm writing a program—particularly when I must leave it for a few days and want to return with some notion of what I was doing.

I use four (sometimes five) routine levels:

DEITY rarely, in lines 0-9
REGAL in the 10 to 99 LNs
EXECUTIVE in the 3-digit lines
WORKER in the 5-digit lines

As a rule (but not without

This program was written in Microsoft disk BASIC version 4.51; in the current versions, 5.0, a space is required between GOSUB or GOTO and the line number. That is, GOSUB9980 is illegal; use GOSUB 9980 instead.

#### 10505 becomes 50500 Program 1. 9804 LPRINT 9806 LN=3: COSUB9980 10005 10070 ' 7000 VARIABLES listing LLIST 6999-9699 A =7100, B =7200, A1=7151, B1=7251, etc. this INDEX 0 'later will jump into pro 1 PRINT CHR\$(27);CHR\$(67); CHR\$(27);CHR\$(76); CHR\$(26);: STOP' 9810 'LIST DEITY LEVEL 9812 LN=4:CL=1:GOSUB9980 9814 PRINT " LISTING:" 9816 LN=5:GOSUB9980 10700+ suggested conventions 10107 CHR\$(26); : STOP' 3 PRINT CHR\$(27); CHR\$(83);: video size 10699 scroll/wraparound switch 10700 9818 PRINT "RUN NEXT> " 10709 5 PRINT CHR\$(26); clear screen 9820 LN=4:GOSUB9980 9823 GOSUB 9990 9824 LPRINT "DEITY level" 10730 'SOME SUGGESTED CONVENTIONS backstops utilities 0-9 generally 10750 "I n#s 98 STOP final program stop 9825 LPRINT ending are used 9826 LN=4: COSUB9980 for: in: 10760 ' 9827 LLIST 0-9 0 stock entries used with 6999 PRGMBASE regularly draft #1 of a prgm 'VARIABLES INDEX 'Var TYPE 10761 ' 1 9829 9830 'LIST REGAL LEVEL 9832 LN=5:CL=1:COSUB9980 9834 PRINT " LISTING (w/ 20-line spacing to allow additions) draft #2 9834 PRINT " LISTING:" 9836 LN=6:GOSUB9980 'B..02.....B..02.. 10772 ' 2 (using the alternate 20-line spacing) draft #3 (revisions) draft # 9838 PRINT "RUN NEXT> " 9839 LN-5:COSUB9980 9842 GOSUB 9990 9844 LPRINT "REGAL LEVEL" 10783 ' 'F. 06. F. 06. 'G. 07. G. 07. 'H. 08. H. 08. 10794 10805 9845 LPRINT 10816 9846 LN=5:COSUB9980 9847 LLIST 10-99 NOTE: 'J. 10. . . . . . . J. 10. . 'K. . 11. . . . . . . . . . K. . 11. drafts come in, the old lines deleted are not 9848 STOP 'L. 12. L. 12. 'LN int LiNe number 'M. 13. M. 13. N. 14. N. 14. they are simply erased 10827 1 9852 LN=6:CL=1:GOSUB9980 9854 PRINT " LISTIN RETURNS LISTING:" 10838 ' 8 temporary checklines & last ditch stuff; LN=7:GOSUB9980 9858 PRINT "RUN NEXT> treat as "extra" 'til 9859 LN=6: GOSUB9980 desperately needed 9862 GOSUB 9990 9864 LPRINT "EXECUTIVE LEVEL" 10849 1 9 spacer lines 1=on, 0=off var Quotient between prgm sections, like 10859 below. i .### 9865 LPRINT 9866 LN=6:COSUB9980 10859 9867 LLIST 99-999 9868 STOP 10860 'PRGM STRUCTURE conventions 'S..19.....S..19.. 'T..20.....T..20.. 10870 'Levels of operation: Deity 1-0 9869 9870 1-digit line#s 2-digit line#s 9870 'LIST MANAGER LEVEL 9872 LN=7:CL=1:GOSUB9980 9874 PRINT "LISTIN Regal 3-digit line#s 4-digit line#s 5-digit line#s Executive Managerial 4-digit lined Worker 5-digit lined 10875 'First digits always deal with X..24.....X..24.. LISTING: " 9876 LN=8:COSUB9980 9878 PRINT "RUN NEXT> " 9879 LN=7:COSUB9980 'Y...25.....Y...25... 9600 'Z..26.....Z..26.. 9697 RETURN'from getting these values like matters, gosubbing thru the levels making ever-finer decisions 'til some worker-lvl 9882 GOSUB 9990 9884 LPRINT "MANAGER LEVEL" 9886 LPRINT:LN=7:GOSUB9980 9887 LLIST 999-6999 'LINE LLISTER UTILITY PRINT CHR\$(26)' cle 9702 PRINT CHR\$(26)' clear screen 9703 CC=32:LN=1:CL=3:COSUB9980' With CC an ASCII blank (32), call 9980 (position & print) does actual processing. 10881 'Thus, branching follows this pattern, generally: 10885 ' 20- 30 REGALS gosub to 200- 300 EXECs which gosub to 200- 3000 MANAG'L, to 2000-30000 WGREERs, etc. 10891 'RETURNS always 'backstitch the seam,'' so 20200-20297 RTNs to the 2021+ range. That could have a 2027 RTN to exec, or a 2030 gosub to 20300. 10901 'Thus the following might be the flow of a typical program, with > & < indicating gosub and return directions. does actual processing. 9888 STOP 9890 'LIST misc SUBRs in 10660-999 9891 LN=8:CL=1:GOSUB9980 9893 PRINT " LISTING:" to place cursor at LN1, CL2, to display: 9706 PRINT "MEXT > RUN f to LList" 9709 CL=10:LN=2:QOSUB9980 pos to pnt: 9895 LN=9:COSUB9980 9897 PRINT " LISTING:" 9897 PRINT "RUN NEXT> " 9899 LN=8:GOSUB9980 9710 PRINT "9770 | Program Index" 9711 LN=3:COSUB9980 9712 PRINT "9790 | VARs Index" 9713 LN=4:COSUB9980 That could 9903 GOSUB 9990 9905 LPRINT "miscellaneous subrs" 9906 LPRINT:LN=8:GOSUB9980 9907 LLIST 10659-10999 9715 LN=4:003059980 9714 PRINT "9810 | DEITY 9715 LN=5:GOSUB9980 9716 PRINT "9830 | REGAL 0-9" 9908 STOP 10-99" 9717 LN=6: COSUB9980 and return directions. 9910 'LIST WORKER LEVEL 9717 EN=0:0030B9980 9718 PRINT "9850 | EXECS 9719 LN=7:GOSUB9980 9720 PRINT "9870 | MGRs [Follow the arrows > right for gosubs, left < for returns, reading down.] 100-999" 9911 LN=9:CL=1:GOSUB9980 9913 PRINT " LISTIN 1000-6999" LISTING:" LN=10:GOSUB9980 PRINT "RUN NEXT 10902 'The letters A-D indicate 9721 I.N=8: COSUB9980 9917 PRINT "RUN NEXT> " 9919 LN=9:GOSUB9980 9722 PRINT "9890 | subrs 10660-10999" 9723 LN=9:00SUB9980 routine and subroutine levels: A = Regal B = Executive 9921 GOSUB 9990 9923 LPRINT "WORKER LEVEL" 9925 LPRINT:LN=9:COSUB9980 9927 LLIST 10999-' to 9724 PRINT "9910 ! WRKRs 11000-" 9725 LN=10:GOSUB9980 9726 PRINT "9930 | this utility" 9729 PRINT CHR\$(30);:STOP' C = Managerial to end 10904 D 10 9928 STOP Await run command 10905 20 > 2000 > 20000 200 > 'LIST THIS UTILITY 20297 'LList PROGRAM INDEX 9770 'LList PROGRAM INDE 9772 LN=2:CL=1:GOSUB9980 20300 9931 LN=10:CL=1:GOSUB9980 2030 > 9933 PRINT " L 9935 LN=1:COSUB9980 LISTING:" place cursor and 9774 PRINT " LISTING:"' 2040 9936 GOSUB 9990 9937 LPRINT "LineLLister utility" 9938 LPRINT 9941 LN=2:COSUB9980 2050 > 20500 2077 < 20797 2100 > 21000 so that it covers the menu item being run 9776 LN=3:COSUB9980' position curso 210 > < 21997 < 2197 < 217 9943 LLIST 9699-9999 22 > 220 > mark place with: 9778 PRINT "RUN NEXT>" 9945 GOSUB 9990 2400 > 24000 LN=2:CL=1:GOSUB9980 9782 GOSUB 9990' skip 3 lines 9783 LPRINT "PROGRAM INDEX LISTING" 9784 LPRINT' skip 1 line 'POSITION CURSOR to PRINT 10906 ' 9980 'PUSITION CURSOR to PRINT 9982 PRINT CHR\$(27); CHR\$(61); CHR\$(LN+31); CHR\$(CL+31); CHR\$(CC);' position cursor and print CC (a blank in this particular usage). 9984 RETURN < 29997 < 2997 30 9785 LN=2:COSUB9980' 35 repark the cursor to spot the "Ok," on completion of LList, at the RUN NEXT>. 9786 LLIST 9999-10699 0788 STD 41 > 410 > 4100 4200 > 42000 'LSKIP 3 LINES subroutine LPRINT:LPRINT:LPRINT 4300 > 4300. 207 < 43997 9788 STOP 9789 9994 RETURN < 4397 Remaining modules follow 440 the same pattern as lines 9770-9788; see sub-routines at 9980, 9990. 10000 ' MASTER PROGRAM INDEX 450 460 > MASTER PROGRAM INDEX to derive an index location for a program line, drop the last 2 digits & add 10000 INDEX 2000 at 10200, 20000 at 10200, 25500 at 10255 4600 > 46000 < 46997 4700 9790 'LIST VARIABLES INDEX 10001 ' 9794 LN=3:CL=1:GOSUB9980 9795 PRINT " LISTING:" 9796 LN=4:GOSUB9980 4800 > 48000 < 48997 10908 < 487 < 4897 50 10002 ' to turn an index number into PRINT "RUN NEXT> " prgm line number, drop first 2 digits & add 2 trailing zeroes 10255 becomes 25500, 10021 becomes 02100, 60 9798 LN=3:COSUB9980 9802 GOSUB 9990 9803 LPRINT "VARIABLES INDEX" 98 final program stop 10999

exception), the lower-numbered lines are privileged to call the higher-numbered lines as subroutines. This is why the 7000-9700 line numbers were chosen as PRGMBASE's variable indexing section—because, simply, there are no worker-level line numbers to call, at 70000-99000, in most systems running BASIC.

There are exceptions to the calling convention because a particular subroutine may be useful from more than one program level. This approach also means that I can use the first digit of any line number as a clue to its task. All line numbers beginning with 2, for example, might direct introductory remarks to the user and offer choices to be made by him.

In a top-down approach to programming, you'd write the DEITY level first, then the REGAL, and so on. Although it might violate the sensibilities of the hardbit top-down devotee, this method of program organization allows you to write and place a tiny subroutine when a neatly turned approach occurs to you...and then to be sure it

works even before writing the calling level.

Fig. 1 shows how the calling convention works. It's also shown in PRGMBASE lines 10904 to 10908; if you adapt your own version of PRGMBASE, having this section in it will provide a quickly available reminder until this approach becomes second nature to you.

### **LListing Made Easy**

A final bonus of this system of program writing is that sticking with the calling conventions means you can selectively produce really useful hard-copy listings. In fact, PRGMBASE contains its own Utility LineLLister in lines 9700-9994. On RUN 9700/cr it generates a video menu that looks like this:

VEXT	RUN	to LList >
	9770	Program Index
	9790	VARs Index
	9810	DEITY 0-9
	9830	REGAL 10-99
	9850	EXECs 100-999
	9870	MGRs 1000-6999
	9890	subrs 10660-10999
	9910	WRKRs 11000-
	9930	this utility

The utility then waits for commands with video keeping the place with its pointer, NEXT >,

at the next line to run for a topdown listing. Of course, I take the option of listing only what I need for a given process. Using this programming method, that almost always means from one level, say MGRs, through the levels it calls. Also, since lines 400-499 will usually call only sections in the 4000-4999 (and, in turn, 40000-49999) portion, I save myself much confusion in figuring out what to list and what to debug. . .and I cut down the paper I have to haul around, too.

### Objections

As you might suspect. I've discussed this approach to programming with others who spend hours looking at video monitors and poking away at keyboards. Some voice an objection that memory is costly, and they don't have any to spare. My response is that it's getting cheaper, but even now they can use the methods at the start of programming, later deleting excess parts or saving one complete annotated copy of the program and "stripping" another for space considerations. Furthermore, I maintain that PRGMBASE can save memory by imposing code-saving outline methods on programmers.

But the most frequent objection surprises me: "But then I can't use RENUMber to bail me out when I run out of line numbers!" Well, yes and no. You can often RENUMber program lines within the strictures of this approach to program writing. Unfortunately, if you have to do an extensive renumbering job on a program, the program index will be nearly useless afterward. But if you think about your programming in a way that will help it all make sense to a (human) program reader later on, you probably will not need the RENUMber option very often.

It's worth the thought, and the time. It is aesthetic to write neat programs for your personal computer which, if appreciated and observed, can lift your interaction with the machine to a new level of elegance. Try it! It'll make your machine just a little more human—not to mention what it'll do for you!

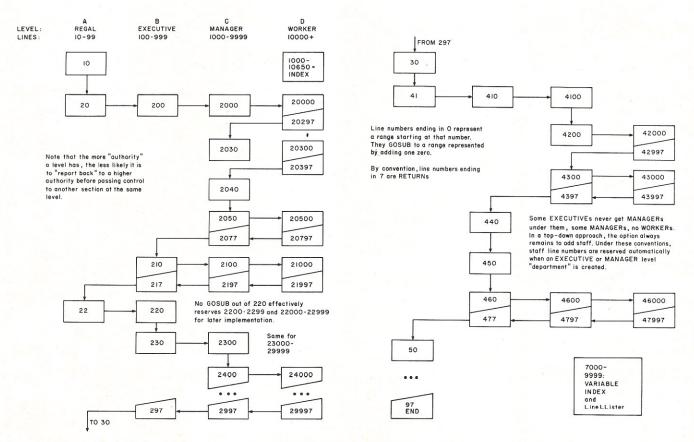


Fig. 1. Calling convention.



### ZIP UP TO 7 SPEEDS!

NOW YOU CAN RUN YOUR TRS-80 RELIABLY 100% TO 125% FASTER (4 MHZ)! Our NEW speedup board enables programs to run 50% slower than normal, normal, and 50%, 70%, 90%, 100%, or 125% faster. A 50% minimum increase is guaranteed (90% to 100% typical); however, DETAILED IN-STRUCTIONS SHOW CHANGES REQUIRED TO THE TRS-80 THAT WILL INSURE RELIABLE OPERATION AT THE 100% OR 125% INCREASE! Software speed control with switch override option allows speed changes AT ANY TIME without program interruption. Our board also compensates for slow memory! Automatic slow down possible during cassette or disk operation (not required for TRSDOS, NEWDOS, and VTOS 4.0!). Power LED changes color (red - yellow - green) to indicate normal, slow, and high speed operation.

ASSEMBLED AND TESTED

VIDEO I. Provides black characters and graphics on an all white screen for a much crisper and easier to read presentation - gives none of the glare associated with plastic screen add-ons. Includes a unit to improve monitor performance.

ASSEMBLED \$23.95



OKIDATA Microline 80 printer. \$559 (list \$800)

Calif. residents add 6% tax. Foreign orders add 10%. Printers shipped

### ARCHBOLD ELECTRONICS

10708 Segovia Way

Rancho Cordova, CA 95670

(916) 635-5408



Dealer inquiries invited



### TOLL FREE ORDERING



	_
NORTHSTAR HRZ 1-32K-D .2100 HRZ 2-32K-D .2340 HRZ 2-32K-O .2690	THINKER TOYS DISCUS 2+21 DRIVE
HARD DISC SYSTEM	SOLID STATE MUSIC         Kit         Assm           SB1 SYNTHESIZER        161         227           VB1B VIDEO        125         170           CB2 Z80 CPU        168         220
DB 8/4	MEASUREMENT SYSTEMS DM 3200 32K 250ns 500
TERMINALS           TELEVIDEO 912         .745           TELEVIDEO 920         .795           SOROC IQ-120         .700	DM 6400 64K 250 ns
PRINTERS  NEC 5510	WORDSTAR
EPSONCALL	11 33-4

**WE WILL TRY TO BEAT ANY ADVERTISED PRICE** Automated Equipment Inc. 4341 W. Commonwealth Ave Suite D Fullerton, Calif. 92633 (800) 854-6003 (714) 739-4701

DISK DRIVE WOES? PRINTER INTERACTION? MEMORY LOSS? ERRATIC OPERATION?

### DON'T BLAME THE SOFTWARE

Power Line Spikes, Surges & Hash could be the culprit! Floppies, printers, memory & processor often interact! Our unique ISOLATORS eliminate equipment interaction AND curb damaging Power Line Spikes, Surges and Hash.



Clear up Software and System problems with an ISOLATOR!



ALL ISOLATORS: • 125 VAC, Standard 3-prong plug

- 1875 W MAX Load 1 KW/Socket or socket bank
- · Balanced Pi Filtered sockets or socket banks
- Spike/Surge Suppression 1000 Amps, 8/20 usec (SUPER ISOLATORS offer expended filtering and Spike/Surge Suppression capabilities)





-3 individually filtered sockets \$ 56.95 **ISO-4** -6 individually filtered sockets 96.95 **ISO-2** -2 filtered banks; 6 sockets . . 56.95 **ISO-5** 79.95 -3 flitered banks; 9 sockets





\*SWITCHABLE ISOLATORS - ALL ISOLATOR advantages combined with the versatility, convenience and utility of individually switched sockets. Each switch has associated pilot

ISO-6 -3 switched, filtered sockets . . . . . . \$128.95 ISO-B -5 switched, filtered sockets

\*SUPER ISOLATORS - Cure for severe interference problems. Useful for Industrial applications and heavy duty controlled equipment or peripherals.

- Dual Balanced Pi Filtered sockets
- Spike/Surge Suppression 2000 Amps, 8/20 usec

ISO-3 -3 super filtered sockets ...... \$ 85.95 139.95

\*CIRCUIT BREAKER any model (add-CB) . ADD 7.00 \*CKT BKR/SWITCH/PILOT any model (CBS) ADD 14.00



PHONE ORDERS 1-617-655-1532 193 Electronic Specialists, Inc.



171 South Main Street, Natick, Mass. 01760

Dept. KB-B

### JINSAM"

- **★ CUSTOM DATA FILES**
- **★CUSTOM REPORTS/LABELS**
- **★KEYED RANDOM ACCESS**
- **★FAST/EASY/MENU DRIVEN**
- **★ MULTIPLE SEARCH KEYS**
- **★ PRIVACY ACCESS CODES**
- **★WILD CARD SEARCH**

### Data Manager

\$175.

JINSAM™ Data Manager for 16K-32K PET/CBM and CBM or COMPU/THINK Disk. (Printer optional). Stores up to 650 Records per disk. Has features listed above, plus

FREE: LABEL PRINTER MODULE FREE: REPORT GENERATOR MODULE

Powerful user commands. Self explanatory, easy to use. Straight forward input and editing routines - "idiot proof". Create any desired relationship.

TYPICAL APPLICATIONS: Personnel files, Customer files, Inventory, Sales records, School records, Appointment schedules, Real estate /Apartment listings, Subscription lists, Research surveys, Mailings.

LISTED BELOW, optional MODULES which interface with JINSAM™ to access the entire database or select Records.

MATHPACK<sup>™</sup> allows +, -, x, ÷ on any numeric field by a Constant or other numeric field. Results temporary or permanent.

STATPACK™ descriptive statistical interface to find Average, Variance, Standard Deviation, Chi Square, Correlations, Regressions, Number of Occurances. Results to screen or printer.

 $\textbf{WORDPACK}^{\text{\tiny{TM}}} \ \ \text{Word Processor interface to personalize}$ text by accessing field contents for mass mailings, reports, invoices . . . Text may be saved, altered and recalled. Powerful commands to edit, center, insert, delete, move blocks of text. Screen editing.

 $\pmb{\mathsf{MULTI\text{-}LABEL}^{\scriptscriptstyle\mathsf{TM}}} \quad \mathsf{module} \ \mathsf{prints} \ \mathsf{multiple} \ \mathsf{labels} \ \mathsf{per}$ Record with 2 line caution message and consecutive numbering. Used for inventory label printing, lot numbering, serial numbering.

**USER'S GUIDE** only **DEMO TAPE \$5** Optional MODULES \$ 25

**DEMO DISK\$8** \$ 40

each

Specify CBM 2040 or COMPU/THINK DISK

Special Offer (Save \$35) Total Package \$300

JINSAM™ + all modules above

Send Check or Money Order plus \$2 Shipping (NY residents add 8% Sales Tax)

- DEALER INQUIRIES WELCOMED -

JINI MICRO-SYSTEMS, Inc. P.O. Box 274-K . Bronx, NY 10463

- 164



CAN HELP YOU... BUY OR SELL. • LOW COST • HOT LINE • TWICE A MONTH

Buy or sell fast with the Computer Instant Ads. The all ad low cost computer publication for individuals and businesses. It's on convenient 8½" by 11" pages in easy to read type.

Bargains - Computers, Components, Peripherals, Software, Positions and Help Wanted, whether you're buying, selling, or swapping you can get fast results at low cost with the CIA.

Instant Ads - If you don't want to wait a few days for the next CIA issue-just dial our special computer hot line number (reserved for subscribers) anytime, 24 hours a day, and our computer will tell your computer (with 300 baud modem) all about the ads received by the CIA since our last issue. Call as often as you like. The only additional expense to you is the price of a direct dial phone call. But remember, if you don't want to pay for the phone call, you only have a few days to wait because the CIA is published TWICE each month.

LOW COST ADVERTISING - Only 10¢ per word for one ad and just 8¢ per word per issue when the same ad is run in two or more consecutive issues.

FREE ADVERTISING — Subscribe now for free advertising. Mail an ad (up to 50 words type written or printed, please) to us with your subscription and we will run it free; or phone your subscription using our toll-free number and charge your subscription to your VISA or Master Charge Card. When you telephone your subscription, we will send you a certificate for a free ad

LOW SUBSCRIPTION RATES

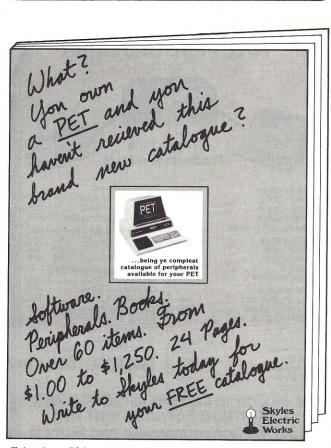
One year (24 issues) only \$13.00 Two years (48 issues) only \$20.00

Subscribe NOW V 115

Call TOLL-FREE 1-800-453-6400 In Utah phone 268-3000

COMPUTER INSTANT ADS ASSOCIATION

277 East 6100 South · Salt Lake City, Utah 84107



Skyles Electric Works

just released. OHIO

SCIENTIFIC

**Problem Solver:** Makes complex decisions based on your criteria. You can't be Cash Flo: Every growth without it. curve—All a

Perfect for your multi-diskette RANDOM file mailing lists, inventory, etc. Ideal for specialized report generation. Sort, merge or combination. All machine language stand-alone package — Efficient and easy to use. No separate key files required! Physical records are rearranged on diskette! Supports multiple sub records per sector including optional sector spanning. Sorts on one or more fields — ascending or descending. Sort fields within records may be character, integer, and floating-point binary. Provides optional output field deletion, rearrangement, and padding.

\*Sort timings shown below are nominal times. Times will vary based on sort and system configurations. Nominal times based on Mod I 48K 4-drive configuration, 64 byte records, and 5 sort keys.

TYPE FILE SIZE SORT TIME TYPE (Bytes)

SORT 16K 49

SORT 32K 49

SORT 34K 49

SORT 34K 50RT 34K 2569

SORT 170K 445

SORT 34B SORT 1 680K 2569

SORT 170K 445

SORT 34B SORT 1 757

SORT 170K 445

SORT 34B SORT 1 757

SORT 170K 445

SORT 34B SORT 1 757

SORT 34B SORT 1 757

SORT 170K 445

SORT 34B SORT 1 757

SORT 35K Merge

DSM for Mod II (Minimum 32K, 2-drive) \$150 On-Disk

Mod II Development Package \$100

Machine Language SUPERZAP, plus Editor/Assembler and diskatte).

packages are now obsolete.

Numerology: At last. SPD makes this accurate tool of the occult available to you.

The Tool Box: Modules in a series of tools for specific business problems.

Real Pak 1: Real estate investment property analysis. Built for pros. Gives you the "hammer" in any deal.

Baccus 1: MDMS compatible or stand alone invoicing and order entry module. We can't be without it.

diskette.)

Mod II Generalized Subroutine Facility 'GSF' \$50

Mod II GSF' \$50

\$30 Disk Specify 8" or 5" documentation 1 STRUCTURED PROGRAM DESIGNERS 371 Broome St., NY, NY 10013 on package \$15 Tape (limited versions) C1 or C2. Or, Send \$2 for full-line full-line

CHECK, VISA, M/C, C.O.D.
Callf. Residents add 6%
Telephone Orders Accepted
(714) 637-5016

7 101

FRACET COMPUTES -

**GSF** (Specify 16, 32, or 48K) **\$24.95** 

## SORT MERGE 'DSM' FOR MOD I AND MOD II TRS-80TM Now you can sort an 85K diskette in less than 3 minutes\* FAST

**INVENTORY MASTER** 

# Goodies from GALACTIC Specialty Programs for TRS-80 Model | - || - |||

MODEL II HOST I/O SYSTEM

From the original author of the TRS-80 HOST and TERM

systems in the RADIO SHACK "COMMUNICATIONS

PACKAGE". This system allows the full control of the HOST

facility by your BASIC program. Set the number of nulls to

be sent after a C/R, set a command line to be executed if

carrier is lost, turn HOST on and off, switch to channel A or B

as desired, enable and disable the ability for the remote terminal to "BREAK" BASIC, identify whether a character

came from the HOST'S keyboard or from the REMOTE'S and

more. No knowledge of assembler needed. All options may

be accessed from BASIC or ASSEMBLER. Complete with

detailed documentation. Don't isolate your Model II, Let

Model II with TRSDOS 1.2 . . . . . . . . . . . \$179.00

Model II with TRSDOS 2.0 . . . . . . . . . . . . . \$199.00

This is the name, address, phone number data base

manager that has set the standard by which other systems

are compared. This system contains advanced editing and

output capabilities. The TRS-80 Model I system will handle

up to 600 records per file, while the Model III version will

handle up to 1150 records and the Model II will handle 2500 records per file. All versions are file compatable and

maintain constant sort indexes on both NAME and ZIP CODE. International PHONE numbers and ZIP CODES are

supported. Thousands of code combinations are available.

The Model II version also has a "word processor" type input

editor and fast assembler sorting. Complete documentation is included with each version of MAIL/FILE.

Model II Version ..... \$199.00

This is an all new concept for this type of game, and

compares to the others like chess compares to checkers.

ULTRA-TREK is a complex, logical game, intended for the

serious contestant. It is doubtful that you will ever master

this game, but you will certainly enjoy trying! This program

outside terminals access it's computing power.

MAIL/FILE SYSTEM

**ULTRA TREK** 

EDAS 4.0 (Editor/Assembler)

This is the highly acclaimed "USER ORIENTED" Assembler for the TRS-80 Model II by GALACTIC. Loaded with features such as assemble to memory, block move, link to debugger, default filenaming, reverse video editing, warm start entry and much more. Now the programmer can write, assemble, test, and debug his code without ever leaving EDAS.

EDAS 4.0 with complete manual (120 pages)

Model II Version ..... Was \$229.00 NOW ONLY \$179.00

MASS/MAIL SYSTEM

This is the NAME and ADDRESS system for subscription control or large mailing lists. It will handle up to 10,500 records, with a worst access time of less than 15 seconds and usual access of less than one second. All adds, deletes, and edits are instant for the operator and are then completed later in a "batch monitor". Extensive documentation and ongoing support. Requires TRS-80 Model II and 2 disk drives minimum. Contact GALACTIC direct for detailed specifications and prices for your exact needs.

Model II Version . . . . . Contact GALACTIC for Price

STOCK MARKET MONITOR

This day to day market monitor is designed for the active trader. The system will track the performance of an issue against the market as well as against itself. The package comes with complete documentation and explainations of the formulas that are used by the program. The system is available for the Model I and the Model III TRS-80.

Model I and III cassette version ..... \$89.00 Model I and III disk version ..... \$99.00

Tired of being a slave to an out-of-control inventory? Let GALACTIC'S INVENTORY MASTER put you in control of your inventory. INVENTORY MASTER operates on a TRS-80 Model I and Model III 48K disk system (Minimum of 2 drives with capabilities of up to 4 drives). Drive spanning capabilities allow you to track 2700 inventory items with a 4 drive system (5100 items for the Model III). Unique machine language sort allows for instantaneous item insertion (approx. 15 seconds with 2700 items in system). Item access can be immediate using system-supplied control numbers. Modeled after a proven main-frame system costing tens of thousands of dollars. Complete add/edit/delete capabilities supported. Placement of orders can be machine-generated as well as usergenerated, with editing capabilities. Full report-generator included. Exquisitely documented.

requires a TRS-80 Level II, 16K or more. The program is written totally in BASIC and uses 15.5K of RAM. Model I & Model III Version

galactic software ltd.

11520 N. Port Washington Rd. Meguon, Wisconsin 53092 (414) 241-8030

Money Orders & COD's Shipped Within 24 Hours. Checks allow 2 weeks.

### **Overlay Programming**

### Small memory space? Take a tip from IBM and try this memory-saving technique.

Robert A. Peck 1276 Riesling Terrace Sunnyvale CA 94087

any microcomputer users start out on small systems such as KIM, SYM, COSMAC and D-2. These one-board BASIC computers all have one thing in common: a minimal amount of memory space reserved for the user program. They often allow as few as 256 bytes of RAM space for user access.

Even when we add the remaining on-board memory to the basic unit, we end up with between 512 bytes and 4096 bytes of available space. When a computer user runs out of on-line memory space, regardless of the size of the system being used, he has various choices:

- 1. Purchase additional memory (with expansion power supplies) and perhaps an adaptation for bus compatibility.
- Sell off the "basic unit" cheaply to a friend or a broker so you can save money to buy a bigger unit with more memory already installed and rewrite your programs to fit the new processor.
- 3. Make the programs fit the available memory space by taking advantage of your off-board mass-storage device and the use of an overlay program structure as described below.

Running out of RAM space happens not only to the small micro user, but also to all of the rest of the processor users from small systems to the giants. These larger-system users use a technique that could prove useful to users of minimal systems as well: the overlay structure.

### How the Big-Systems Users Do It

This technique called overlay is often applied to devices in which a functional program takes up almost all of the available memory-storage space. In order to check out the operational characteristics of the device, reserve an area of the RAM for the loading of the diagnostic programs.

If the diagnostic program storage area is small, an interlinked chain of programs may be called in to test each machine function, in turn, and to report the results of that portion of the tests. After this, the next routine in the chain is read into that same memory section as occupied by its predecessor. Then control is given to this next program segment for its diagnostic operation.

It is called an overlay structure because the new diagnostic program entirely erases and replaces the program that precedes it. Each program is stored and executed from only that segment of the memory reserved for the storage of the diagnostic routines.

When the diagnostics are completed, the machine allows the option of either running more diagnostics or returning control to the master program. That master program would, in this case, have taken up most of the available RAM space, and

the troubleshooting diagnostics would have taken up relatively little space.

There are several reasons for this:

- The unit is designed so that it works "perfectly" most of the time
- 2. The master program, for economic reasons, takes up most of the space in that there is little reason to install any more memory than absolutely needed for normal operation.
- 3. The diagnostic routines can be made simple enough so that each may check a small number of basic machine functions.
- 4. Depending on the capabilities of the mass-storage device associated with it, there may be little reason to limit the total number of diagnostic routines

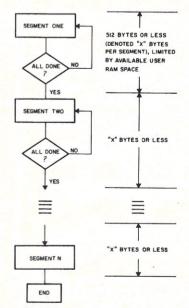


Fig. 1. The initial step—program segmentation.

loaded one at a time, except to use sufficient programs to have tested all desired basic functions of the device.

Therefore, .for the machine type, which is described above, when power is applied, we would load the master program, which runs all of the basic functional items in the machine, including monitoring the control switches. If a diagnostic routine is desired, that routine is loaded into a separate segment of RAM and is executed. After this, control passes again to the main program, which may load another diagnostic routine or simply continue on with its normal operating sequence.

As stated, the device we examined earlier used most of the RAM space for the storage of the functional program and only a small amount for the diagnostic routines. The small-system user, however, is more likely to reserve a maximum portion of his RAM space for the program material.

### **Program Structure**

As an initial plan for fitting a large program into a small space, we must first consider structuring the program as noted in Fig. 1. Each of the segments should be capable of fitting individually into the available user RAM space.

Note the linear flow between the segments in Fig. 1. The diagram is intended to show the need for these segments to operate independently. Using the logic outlined in Fig. 2, we can see that a relatively small control program can be used to LDA NXTSEG ;load acc with next segment ID number ;store in tape ID byte search compare area ;call tape-load subroutine (part of monitor) ;jump to the starting point of this routine ;(not the next routine)

Example 1. A typical link call sequence.

oversee the loading and execution of a considerably larger segmented program.

Fortunately, many manufacturers of single-board computers write their tape-load programs as subroutines within the monitor program. Although these routines are normally called by the monitor and return control to the monitor, we can use them within our programs and regain control from the subroutines after the tape load has been completed. Thus, we can effectively reduce the size of our control program by efficient use of the monitor subroutines.

There may be occasions, however, when even the relatively small size of the control program tends to get in the way. This could happen if there is a need to transfer a large number of variables between program segments. This forces us to reserve more of the control program space for common area storage.

### **Linking Program Segments**

If control program space is in a squeeze, we could, instead, place the cassette subroutine call linkage within each of the program segments. Thus, each individual segment would have duplication of the tape-load subroutine call, but we would have possibly reserved more space by this means for the passing of variables between program segments.

As an example, let's look at a typical tape-load routine linkage that might be contained within a single program segment. It could be placed at the logical end of the segment because it is considered the exit point from that segment and the linked entry to the next segment (see Example 1). The last line, at first glance, may be a little difficult to understand, but with a little explanation it is really quite clear.

Since this is an overlay structure, each program segment completely replaces the original segment that occupied that RAM space. When we jump to the tape-load subroutine, the program counter contents are pushed onto the stack. When we complete the tape load, the return address is popped off the stack and reloaded into the program counter.

At this point, the processor executes the instruction currently residing at the location immediately following the locations formerly occupied by the call to the tape-load subroutine. So we went off to a tape-load routine and when we came back to the area originally occupied by the calling program, we were actually jumping into a new program that has since replaced it in that same memory space. Therefore, when we return, we will execute a jump to the start location of the newly loaded segment. By maintaining the same structure in each of the

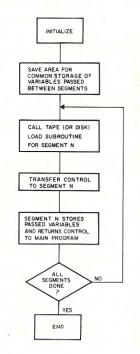


Fig. 2. The overlay control program structure.

0200	Segment 3	0200	Segment 4
	Program		Program
03F5	LDA 04	03F5	LDA 05
03F7	STA TAPEID	03F7	STA TAPEID
03FA	JSR TPLOAD	03FA	JSR TPLOAD
03FD	JMP BEGIN03	03FD	JMP BEGIN04

Example 2.

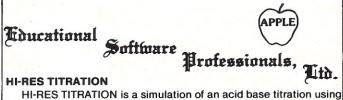
segments, however, we can always assure that the processor knows where to find its next instructions.

To demonstrate this, let's put some numbers with the example above (see Example 2). After we have executed the main body of segment 3, we load the accumulator with the value of the next segment's ID code at 03F5. Then at 03F7 we store it in the byte area where the tape-load routine looks for a comparison to the tape ID being read. Now, at 03FA, we jump to the tape-load subroutine from segment 3. This will load segment 4 into locations 0200-03FF, where segment 3 was before.

When we execute the return

from the tape-load subroutine, the processor will execute the instruction at 03FD. This instruction, you will note, is now a segment 4 instruction, not segment 3, due to the overlay that has occurred. Therefore, within that segment 4, the instruction indicates a jump to the beginning of segment 4 as other segments will, in this same area, indicate a jump to their own starting areas.

Thus, if all of the program segments are constructed in this manner, we will only be limited by the adaptability of the program to this type of structuring. For the memory-limited programmer, this method may prove to be useful.



HI-RES TITRATION is a simulation of an acid base titration using the Apple high-resolution color graphics. The program was written for use as a prelaboratory preparation and practice. It is effective as a lecture demonstration or for use by individual students. The program was written for high school use, but it is also useful for college chemistry classes.

32K Applesoft with Disk ...... \$19.95

### RETAILING MATH

RETAILING MATH is a computer assisted instruction in the fundamentals of pricing mathematics. Lessons and reviews dealing with the mark-up equation, mark-up percentage and determining retail and cost prices are reinforced thru interactive exercises after each lesson by vocationally certified instructions.

48K Applesoft with Disk \$39.95

### **EDUCATIONAL CHARADES**

EDUCATIONAL CHARADES is an age-long game modified for classroom use. The teacher can create charade files relative to the current subject being taught.

32K Applesoft with Disk ...... \$19.95

APPLE-GRAMMER requires 32K in Applesoft and a disk drive .... \$19.95

38437 Grand River ● Farmington Hills, MI 48018 (313) 477-4470 

Dealer' Inquiries Welcome

### A Roundoff Function in Applesoft

### Keep your numbers at a manageable length.

Barton M. Bauers, Jr. 30 Hillock Drive Wallingford, CT 06492

When writing programs in Applesoft, you will occasionally need to round off an answer to a specified number of decimal places. Example 1 shows a simple function that will handle almost all of your round-off requirements.

If you place this function at the beginning of your program, you need only to set XQ equal to the number of decimal places you wish to have in your final answer and use the statement VAR = FN RD(VAR), where VAR is the name of any real (floating-point) variable in your program.

### How the Function Works

Review the function and dissect it into its constituent elements. The function breaks down into six pieces:

First, (10  $\wedge$  XQ) raises the value ten to a power that is the same number as the number of decimal places you want in your answer.

Second, X\* multiplies the result of (10  $\Lambda$  XQ) times the variable you wish rounded.

Third, +.5 adds one-half to this result. Fourth, INT takes the integer representation of the result of step three.

Fifth,  $(10 \land (-XQ))$  raises the value ten to a power that is the negative equivalent of the number of decimal places you want in the answer.

Sixth, multiply the results of step five by the results of step four.

Consider the example 4.457453. We will use this number to demonstrate how FN RD(X) works. Assume for now that you want this number rounded to two decimal places. Using the six steps above, the function described will calculate the correct value as follows:

XQ will equal 2, the number of decimal places you want in your answer. Therefore, (10  $\Lambda$  XQ) will equal (10  $\Lambda$  2), or 10 squared, which is 100.

The variable X is equal to 4.457453. Note that X is only a phantom variable, to be replaced by the actual variable you use. Multiplying X by the result of step one, 100,

DEF FN RD(X) = INT(X • (10  $\land$  XQ) + .5) • (10  $\land$  (-XQ))

Example 1.

gives us 445.7453.

To the result of step two we add .5, so our new value is 446.2453.

By taking the integer value of this number, we will get 446.

 $(10 \ \Lambda \ (-2))$  (remember, XQ was set to 2) is the same as  $1/(10 \ \Lambda \ 2)$ , which is equal to 1/100, or .01.

Multiplying 446\*.01, we get the final answer: 4.46.

### **Not Perfectly Round**

While this function will provide accurate rounding in almost all of your programs, it is not 100 percent perfect. Some values, when internally represented in your computer, are pre-rounded: the actual value that FN RD(X) sees when it starts its work is not the same number that was keyed in. This will cause a slight under- or over-rounding, but it is not the fault of the function. Indeed, I have worked with FORTRAN programs and have written similar rounding functions and have encountered similar minor rounding differences for some values.

You should therefore carefully consider whether or not an occasional rounding difference is acceptable. If it is not, then you should further question whether or not any rounding is appropriate for that problem.

### If you have no label handy, print OLD address here. Name \_ Let us know 8 weeks in advance so that you won't Address \_\_\_\_\_ miss a single issue of Kilobaud Microcomputing. \_\_\_\_\_ State\_\_\_\_\_ Zip\_ Attach old label where indicated and print new address in space provided. Also include your mailing label whenever you write concerning your subscription. It print NEW address here: helps us serve you promptly. Name ☐ Address change only ☐ Payment enclosed ☐ Extend subscription Address \_ ☐ Enter new subscription ☐ Bill me later \_\_\_\_ State\_\_\_\_ Zip\_ ☐ 1 year \$25.00

# Accessories and Software for Apple, Commodore, TRS-80, Atari

Call TOLL FREE - 800-421-0347





### **ACCESSORIES**

The state of the s
CORVUS 10 MEGABYTE DISK DRIVE \$464
COHVUS IU MEGABITE DISK DRIVE 3404
PASCAL LANGUAGE SYSTEM
CRAPHICS INDIT TARIET
CHAPTICS INFOT TABLET
DISK II WITH CONTROLLER CARD
DISK II with CONTROLLER CARD DISK II without controller
APPLE SOFT II FIRMWARE CARD
AFFLE SOFT II FINWWANE CAND
INTEGER FIRMWARE CARD PARALLEL INTERFACE CARD
PARALLEL INTERFACE CARD L
CEDIAL INTEREACE CARD
SERIAL INTERPACE CARD
SERIAL INTERFACE CARD
SERIAL INTERFACE CARD
SERIAL INTERFACE CARD
CUD D TEDM 00 and CARD
SUP-R-TERM 80 col. CARD 34
DAN PAYMAR Lower case kit 4
SVA 8" DISK CONTROLLER CARD 34
CCS ARITHMETIC PROCESSOR CARD. 34
CCS ANTINWETIC PROCESSOR CARD. SA
CLOCK/CALENDAR CARD 23
INTROL X-10 SYSTEM 23
SUPER TALKER SPEECH SYNTHISIZER 25
ROMPLUS CARD W/KEYBD. FLTR 17
HEURISTICS SPEECHLINK 2000 22
DC HAYES MICROMODEM II
ALF MUSIC SYNTHISIZER 24
SSM A10 CARD (KIT)
SSM A10 CARD (ASSEMBLED) 16
NOVATION CAT MODE M
CCS GPIB IEEE INTERFACE 26
MICROSOFT Z-80 SOFT CARD w/CP/M 34
MICROWORKS DS-65 DIGISECTOR 34
ROMWRITER 15
NOMWHITEN
SYMTEC LIGHT PEN CARD 22
CCS PROGRAMMABLE TIMER MODULE 15
CENTRONICS PRINTER INT. CARD 18
SLIENTYPE PRINTER W/INT. CARD 52
ADDI E COETMADE

	A	7	ᄔ	50	J	1	-		1	V	ľ	7	F	1	l	ī	Ĺ	
3	MILE	ISLA	AND.	Muse														39
3	D AN	IIMA'	TION	-D. Pr	O	ar	a	m	п	18	1	Ir	٦t	1				24

S WILL ISLAND, WIGSO	
3-D ANIMATION-D, Programma Intl 24.5	
3D ANIMATION, Sub Logic	
3D GRAPHICS, Programma Intl 24.9	X
6502 ASSEMBLER, Personal S/W 24.9	
8080 SIMULATIONS, Sybex 19.9	
ABBS, Periph Unitd49.5	K
ACCOUNTING ASSISTANT, Instant S/W 7.9	×
ADDRESS BOOK, Muse 49.9	X
ADVENTURE 3 & 4, Creative Comp 24.9	
ADVENTURE-D, Microsoft	×
ADVENTURE-D, Programma Intl 21.9	
ADVENTURELAND, Creative Comp 14.9	
ALIEN LANDER, Sierra Software 24.9	
AMPERSORT 2, Programma Intl 15.9	
ANALYSIS 1, Galaxy	
ANALYST, Programma Intl 15.9	×
APMAIL, Programma Intl 19.9	
APPILOT, Muse	
APPLE DOC, Sowest Data	
APPLE LISNER, Softape 19.9	X
APPLE PIE-D, Programm Intl 24.9	×
APPLE PILOT, Programma Intl 24.9	
APF'LE PLANET, Programma Intl 24.9	×
APPLE POST, Apple 50.0	X
APPLE WRITER, Apple	X
APPLEFORTH, Programma Intl 49.9	
APPLESOFT OPTIMIZER, Programma . 19.9	×
APPLESOFT OPTIMIZER, Programma . 19.9	×

ı	APPLESOFT PLUS, Programma Intl	24.95
	APPLETALKER, Softape	15.95
	APPLEWORLD, United Software	59.95
	ASSEM LANG DEVELOPMENT, Hayden	39.95
	ASTEROIDS Quality Softwar	19.95
	ASTROAPPLE, Software Factry	15.00
	AUTOCHECKERS, Programma Intl	15.95
	APPLEWORLD United Software ASSEM LANG DEVELOPMENT, Hayden ASSEMBLER, Microproducts ASTEROIDS, Quality Softwr ASTROAPPLE, Software Factry AUTOCHECKERS, Programma Intl. B I T S, Periph Unitd BABBLE, Software Factry BASEBALL, Muse BATTLESHIP COMMAND, Quality Sitw BATTLESHIP COMMAND, Quality Sitw BATTLESTAR 1, Programma Intl BAZOOKA, Programma Intl BEST OF BISHOP, Softape. BLOCKADE, Personal S/W.	34.95
	BABBLE, Software Factry	15.00
	BATTI ESHIP COMMAND Quality Stay	14.85
	BATTLESTAR 1, Programma Intl	15.95
-	BAZOOKA, Programma Intl	15.95
	BEST OF BISHOP, Softape	39.95
	BLOCKADE, Personal S/W	14.95
	BRAIN GAMES Creative Comp	7 95
1	BRIDGE CHALLENGER, Personal S/W	14.95
	BRIGHT PEN, Softape	34.95
	BUSINESS/FINANCE, Programma Intl	19.95
	CAI PROGRAMS-D, Creative Comp	14.95
ı	CASTLE ADVENTURE, Programma Inti.	15.95
	CHECKBOOK Apple	20.00
	CHECKBOOK, Programma Intl	34.95
1	CHECKBOOK KING-C, Personal S/W	19.95
	CHECKER KING-C, Personal S/W	19.95
1	CLOWNS & BALLOONS Programma	15.05
	BEST OF BISHOP, Softape. BLOCKADE, Personal S/W BOWLING, Apple BRAIN GAMES, Creative Comp. BRIDGE CHALLENGER, Personal S/W BRIGHT PEN, Softape BUSINESS/FINANCE, Programma Intl. CAI PROGRAMS-D, Creative Comp. CASTLE ADVENTURE, Programma Intl. CCA DATA MGMT., Personal S/W CHECKBOOK, Apple CHECKBOOK, Programma Intl. CHECKBOOK, Programma Intl. CHECKBOOK, Programma Intl. CHECKBOOK KING-C, Personal S/W CHECKER KING-D, Personal S/W CHECKER KING-D, Personal S/W CLOWNS & BALLOONS, Programma COMPUMATH, Edu Ware COMPUMEAD. Edu Ware CRAPS, Softape	39.95
١	COMPUREAD, Edu Ware	24.95
ļ	CRAPS, Softape	14.95
1	DARS DISK, Periph Unitd	24.95
1	DATA MANAGER Havden	49.95
1	DATABASE, Programma Intl	19.95
ı	DATABASE II, Programma Intl	29.95
١	COMPUREAD, Edu Ware CRAPS, Softape. DANS DISK, Periph Unitd DART ROOM, Programma intl DATA MANAGER, Hayden DATABASE, Programma Intl DATABASE II, Programma Intl DATABASE II, Programma Intl DATABASE MAIL-D. Programma Intl	29.95
1	DATAMOVER. Apple DDU & SDC, Periph Unitd. DEPTH CHARGE, Programma Intl DISASSEMBLER. Microproducts DOW JONES Apple	30.05
1	DEPTH CHARGE Programma Inti	15.95
1	DISASSEMBLER, Microproducts	34.95
١	DOW JONES, Apple	50.00
١	DISASSEMBLER, Microproducts DOW JONES, Apple DUAL RACE. Systems Design EARTHQUEST-D. Programma Intl EASY WRITER. Personal Softwr ELECTRIC CARD FILE. Softape ELECTRIC CARD FILE. Softape ELECTRIC CRAYON. Muse ELEMENTARY MATH, Muse. ENERGY AUDIT-C. Instant S/W ENGINEERING MATH-1. Hayden ESCAPE. Muse. FASTGAMMON-D. Quality Softwr FASTGAMMON-D. Quality Softwr FILE HELPER, Baclan. FINANCE PACK, Apple FLASH CARDS, Programma Intl FLIGHT SIMULATOR, Sub Logic FOOTBALL. Programma Intl	16.95
١	FASY WRITER Personal Softwr	99.95
1	ELECTRIC CARD FILE, Softape	19.95
	ELECTRIC CRAYON, Muse	17.95
	ELEMENTARY MATH, Muse	39.95
1	ENGINEERING MATH-1 Havden	14.95
1	ESCAPE, Muse	12.95
1	FASTGAMMON-C, Quality Softwr	19.95
1	FASTGAMMON-D, Quality Softwr	24.95
	FILE HELPEH, Bacian	35.00
1	FLASH CARDS Programma Intl	9.95
1	FLIGHT SIMULATOR, Sub Logic	25.00
1	FORM LETTER, Periph Unitd	. 9.95
	FORTE, Softape FORTH, Softape EPACAS C. Quality Software	49.95
	FRACAS-C, Quality Softwr	19.95
	FRACAS-D, Quality Softwr	24.95
	GALACTIC CONFLICT, Programma Intl	15.95
1	GAME PLAY W/BASIC, Hayden	9.95
	GAME PLAY W/BASIC 2, Hayden	9.95
1	GAMON GAMBLER-C, Personal S/W	19.95
	GAUNTLETS, Programma Intl	99.95
	GENERAL MATH-1, Hayden	14.95
	GOBLINS, Programma Intl	15.95
	GRADE BOOK, Creative Corp	24.95
	GRAPHIC UTILITIES, Personal S/W	14.95
	HI HES ADVENTURE #1, On Line Syst .	24.95
	FORTH, Softape. FRACAS-C, Quality Softwr FRACAS-D, Quality Softwr FRACAS-D, Quality Softwr GALACTIC CONFLICT. Programma Intl GAME PLAY w/BASIC. Hayden. GAME PLAY w/BASIC 3, Hayden GAME PLAY w/BASIC 3, Hayden GAMON GAMBLER-C, Personal S/W. GAUNTLETS, Programma Intl GENERAL MATH-1, Hayden GLOBAL WAR, Muse GOBLINS, Programma Intl GRADE BOOK, Creative Corp GRAPHIC UTILITIES, Personal S/W. HI RES ADVENTURE #1, On Line Syst HIRES PLAYGROUND. Systems Design HOME ACCOUNTING-C. Programma Intl MACCOUNTING-C. Programma Intl ME ACCOUNTING-C. PROGRAMMA INTL M	1 9.95
	HOME ACCOUNTING-C, Programma In HOME ACCOUNTING-D, Programma HOUSEHOLD FINANCE, Programma	15.95
	HOUSEHOLD FINANCE, Programma	24.95
	HOUSEHOLD INVENT, Programma INSTANT LIBRARY-C, Softape INSTANT LIBRARY-D, Softape-39.95	24.95
	INSTANT LIBRARY D. Softens 20 05	Jy.95
	JOHN'S DEBUGGER, Broderick	35.00
	JOHN'S DEBUGGER, Broderick LASER TURRET, Programma Intl	. 9.95
	LISA, Programma Intl	34.95
	MAIL LIST, Periph Unitd	39.95
1	MATCHWITS, Programma Intl	. 3.50

# IF YOU DON'T SEE IT HERE, CALL US. WE CARRY EVERYTHING FOR APPLE, TRS-80, COMMODORE, VECTOR, ATARI, SORCERER, TEXAS INSTRUMENTS, AND MORE!

11101161	
STATISTICS, Programma Intl	19.95
STATISTICS, Edu Ware	17.95
STIMULATING SIMULATIONS,	
Personal S/W/	14.95
Personal S/W/STOCK MARKET, RTR	79.95
SUPER TEXT Muse	100.00
SUPERCHIP, Eclectic	100.00
TALKING CALCULATOR, Softape	12.95
TALKING DISK, Programma Intl	. 19.95
TEXT EDITOR, Periph Unitd	59.95
THE CASHIER, Apple	250.00
THE CONTROLLER, Apple	625.00
THE SOURCE. Periph Unitd	25.00
THE SOURCE, TCA	
THE TYPESETTER, Programma Intl	29.95
TIC TAC TALKER, Softape	19.95
TIME CLOCK, Programma Intl	
TIME TREK, Personal S/W	
TINY PASCAL, Programma Intl	
TRAPSHOOT, On Line	
TRIVIA ][, Programma Intl	. 15.95
TURF ANALYSIS, Systems Design	
TYPE TRAINER, Programma Intl	
TYPING TUTOR, Microsoft	
UNCLE SAM, Muse	
UPDATES, Periph Unitd	
VISICALC, Personal S/W	
VOYAGER EXCURSION, Programma	15.95
WEIGHT PLOTTER, Programma Intl .:	
WHATSIT, Computerheadgr	125.00
WINDFALL, Edu Ware	19.95

CALL US TOLL FREE FOR NEW CATALOG OF ACCESSORIES & SOFTWARE 800-421-0347



### ACCESSORIES

Commodore Dual Floppy Disk Drive \$1,285.00
Second Cassette-from Commodore 95.00
Commodore PET Service Kit 30.00
Beeper-Tells when tape is loaded 24.95
Petunia—Play music from PET 29.95
Video Buffer-Attach another CRT 29.95
Combo-Petunia abd Video Buffer 49.95
TNW Bi-Dir.RS-232 printer S-face 229.00
KIM A (A Single Board Computer
from Commodore) 179.00
CMB 8050 Dual Drive Floppy Disk 1,695.00
CBM Modem
CBM Voice Synthesizer 395.00
PET TO IEEE Cable
IEEE TO IEEE Cable
KIM1 & Power Supply Package Special 200.00

### PET SOFTWARE

SOFTWARE	
ACTION, Soundware ACTION GAMES, Creative Comp ALPHABET, Commodore AWARI, Programma Intl BACKGAMMON, Commodore BASIC BASIC, Commodore BASIC BATH, Commodore BASIC BATH, Commodore BATTESHIP, Programma Intl BLACKJACK, Commodore BLOCKADE, Programma Intl BLOCKADE, Programma Intl BLOCKADE, Programma Intl BLOCKADE, Programma Intl CHECKER KING, Commodore BRIDGE CHALLENGER, Personal S/W CHASE, Programma Intl CHECKER KING, Personal S/W COSTING, Commodore DATA BASE UTILITY, Commodore DETH CHARGE, Programma Intl DIET PLAN, Commodore DETH CHARGE, Programma Intl DIET PLAN, Commodore DISASSEMBLER, Commodore DISASSEMBLER, Commodore	. \$9.95
ACTION GAMES, Creative Comp	. 7.90
AWARI, Programma Intl	. 9.95
BACKGAMMON, Commodore	9.95
BACKGAMMON, Hayden	10.95
BASIC FINANCE, Commodore	24.95
BASIC MATH, Commodore	29.95
BATTLESHIP Brogramma lati	. 10.95
BLACKJACK Commodore	. 9.95
BLOCKADE, Programma Intl	. 9.95
BLOCKADE, Personal S/W	. 14.95
BRIDGE CHALLENGER Personal S/W	14 95
CHASE, Programma Intl	. 9.95
CHECKBOOK, Commodore	24.95
CHECKER KING, Personal S/W	. 19.95
COSTING. Commodore	19.95
DATA BASE UTILITY, Commodore	24.95
DEPTH CHARGE, Programma Intl	. 9.95
DISASSEMBLER Commodore	24.95
DOW JONES, Instant S/W	. 7.95
DUNGEON OF DEATH, Instant S/W	. 7.95
GAME PLAY W/BASIC Hayden	9.95
GAME PLAY w/BASIC 2, Hayden	9.95
GAME PLAY w/BASIC 3, Hayden	. 9.95
GRAPHIC GAMES #1, Creative Comp	7.95
GRAPHIC UTILITIES, Personal S/W	14.95
GRAPHICS, Commodore	. 9.95
DEPTH CHARGE, Programma Intl DIET PLAN, Commodore DISASSEMBLER, Commodore DOW JONES, Instant S/W. DUNGEON OF DEATH, Instant S/W. GALAXY GAMES, Commodore GAME PLAY W/BASIC, Hayden GAME PLAY W/BASIC 2, Hayden GAME PLAY W/BASIC 3, Hayden GRAPHIC GAMES #1, Creative Comp GRAPHIC GAMES #1, Creative Comp GRAPHIC GITLIFIES, Personal S/W. GRAPHICS, Commodore GUESS A SENTENCE, Commodore HANDS ON BASIC, Commodore	29.95
GUESS A SENTENCE. Commodore HANDS ON BASIC. Commodore HANDS ON BASIC. Commodore HOME ACCOUNTING, Programma Intl. LOGIC #1. Creative Comp. LOGIC #2. Creative Comp. MACHINE LANGUAGE. Commodore MAYDAY, Hayden. MICROBASEBALL. Hayden. MICROCHESS. Personal S/W. MONITOR, Programma Intl. MORTGAGE. Instant S/W. MORTGAGE. Instant S/W. MORTGAGE. Commodore NUMBER GAMES. Creative Comp. NUMBER REVERSAL. Commodore ON THE HOUSE. Commodore ON THE HOUSE. Commodore	14.95
LOGIC #1. Creative Comp	7.95
LOGIC #2, Creative Comp	. 7.95
MACHINE LANGUAGE, Commodore	9.95
MICROBASEBALL Havden	9.95
MICROCHESS, Personal S/W	19.95
MONITOR, Programma Intl	. 6.95
MORTGAGE, Instant 5/W	14 95
NUMBER GAMES, Creative Comp	. 7.95
NUMBER REVERSAL. Commodore	. 9.95
PERSONAL ACCTING Programma Intl	9.95
PET SHOW, Commodore	9.95
PET SHOW. Commodore PIRATE ADVENTURE, Creative Comp. PROJECTILE MOTION. Commodore REALTY. Commodore RHYMING, Commodore SPRIES/PARALLEL Commodore	14.95
PROJECTILE MOTION, Commodore	19.95
RHYMING Commodore	9 95
SERIES/PARALLEL, Commodore SLOT MACHINE, Programma Intl SOME COMMON BASIC PROB-D.	19.95
SLOT MACHINE, Programma Intl	. 6.95
Oshorne & Assoc	0.05
SPACETALK, Commodore	9.95
SPACETREK, Commodore	. 9.95
STATISTICS, Commodore	29.95
Osborne & Assoc  SPACETALK, Commodore  SPACETREK, Commodore  STATISTICS, Commodore  STOCK PROTFOLIO, Commodore  STRATHCLYDE BASIC, Commodore  TARGET PONG Commodore	14.95
TARGET PONG, Commodore	. 9.95
TIME TREK, Personal S/W	14.95
STRATHCLYDE BASIC, Commodore. TARGET PONG, Commodore TIME TREK, Personal S/W TREK X. Instant S/W. USER PROT COOKBOOK, Commodore UTILITIES, smithware WORD PROCESSING 2. Commodore WORD PROCESSING 2. Commodore. 1 WORLD CLOCK, Commodore. 2	7.95
USER PROT COOKBOOK, Commodore	9.95
UTILITIES, Smithware	. 7.95
WORD PROCESSING 2 Commoder	14.95
WORD PROCESSING 3. Commodore 1	55.55 199.95
WORLD CLOCK, Commodore	. 9.95
	/



### **Clock Control Board**

### Speeds up your TRS-80...elegantly.

Mark A. Schimelman, M.D. 255 Townhouse Hershey PA 17033

The TRS-80 is a great computer... almost. The people at Tandy Corporation did a good job of building an efficient, reliable machine at low cost. They did not, however, put everything that they could have into that handsome case to make it the most desirable machine on the market.

Some of the more commonly recognized omissions include the lack of lowercase characters, the lack of standard TV video modulation, the inability to include Level I and II ROMs in the same machine and a relatively slow clock for microprocessor operation.

Fortunately, hardware buffs, being compulsive creatures, cannot stand such a vacuum. They have created a whole library of solutions—some of which are elegant in concept and function—to each of these problems. I recently purchased one such elegant device, the TRS-80 Clock Control Board, produced by William Archbold, 106 Snyder Dr., Mather AFB CA 95655.

I mailed off my \$14.95, because Bill promised in his ad that the user could control the clock rate with simple Level II commands and change clock rates without destroying resident programs (a problem I had with previous modifications). My kit arrived promptly eight days afterward and included a clock control board, instruction manual, hookup wire and double-sticky pads for mounting in the computer case.

### **Control Board**

The clock control board is a professional-quality  $2\frac{1}{2} \times 1\frac{1}{2}$  inch double-sided PC board with four ICs, a resistor and a capacitor already preassembled. There are nine clearly labeled holes for the connection of the board to the motherboard via jumper wires.

The manual is simple and clearly written with a good diagram showing proper connection points (see Fig. 1) and a schematic of the control board

Z56, pin 8, is cut. Total installation time was one hour, which included double-checking the wiring twice. The board worked perfectly the first time.

When the computer is powered up, the control is automatically set to the normal 1.77 MHz rate. To change the rate to 2.66 MHz, all you have to do is type OUT 254,1 ENTER; to change back to 1.77 MHz, type OUT 254.0 ENTER. This control statement can be part of a program or entered at any time via the keyboard.

As you might imagine, this adds a new measure of flex-

utilized either mechanical or electronic switches to switch clock rates. The problem was that the switch often occurred at some random point in a microprocessor cycle, leaving the processor in limbo so that by the time the rate settled at a new frequency, the microprocessor was lobotomized. The user then had to power-down and repower-up to sync everything again.

None of that is necessary with the Clock Control Board since it is controlled by an OUT instruction and, hence, always occurs between microprocessor instructions. Thus, you have

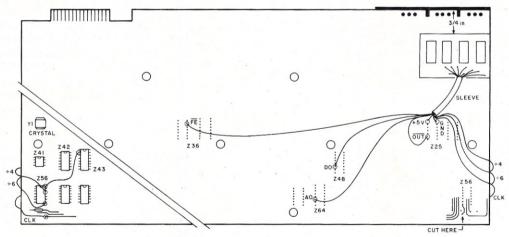


Fig. 1. Connection points.

circuit.

Assembly consisted of cutting the hookup wire to appropriate lengths as described in the manual and soldering them first to the clock control board and then to the appropriate points on the motherboard. Finally, a jumper connection was made between Z43, pin Z, and Z56, pin 14. The trace from

ibility in programming control. Cassette tapes can be read or written at either clock rate, giving effective baud rates of 500 or 750. Computer graphics and computational time can be cut by one-third as well, all under complete computer control. This is truly elegant design and engineering!

Previous clock modifications

clock rate control under complete computer control without cutting any more holes in the computer case.

As you may have surmised, I am delighted by the TRS-80 Clock Control Board. It is a simple-to-install, easy-to-understand kit that does what it claims to do. I recommend it highly . . . good job, Bill!



CHARACTER SET: Full 96 Character ASCII Set (upper and lower case with expanded print).

PRINT HEAD: 100 x 106 character life expectancy.

GRAFTRAX OPTION\* full dot addressable graphics (480 dots/

line) with Automatic print head protection on dense pictures plus form feed and skip over perforation.

FREE! APPLESOFT-WARE for graphics dump included

\*UPDATE EARLIER TX-80's TO GRAPHICS for \$99

Masterchrage & Visa O.K. DEALER INQUIRIES INVITED

**Computer Corner of New Jersey** 

439 Rt. 23, Pompton Plains, N.J. 07444
PRICES SUBJECT TO CHANGE (201) 835-7080



You may love Wayne Green . . . you may hate him . . . but you have to admit he has vision. And that vision created 80 Microcomputing—the only major publication devoted to today's largest selling computer.

80 Microcomputing is not just any computing magazine . . . it's a magazine written for the users of Tandy's TRS-80\*, a magazine written to tell you the truth about it. Wayne Green has never been one to mince words and so 80 Microcomputing tells you the good things about the TRS-80\* and the not so good. 80 Microcomputing also has reviews of compatible equipment, programs and applications, plus users reactions that let you know how the TRS-80\* works and what it can do. Also you can save hundreds of dollars on equipment by buying what you know is right. And of course, 80 Microcomputing has the editorial fireworks from Wayne that the industry has come to

So subscribe to 80 Microcomputing . . . the industry's only major publication for your computer ... the TRS-80\*.

Circle 60 on the Reader Service card for a subscription form . . . or call use at 800-258-5473.

\*TRS-80 is a trademark of Tandy



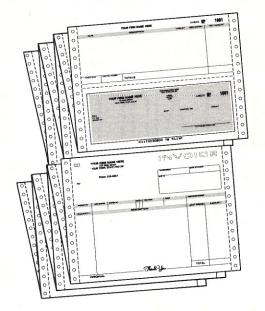
### REE COMPUTER FORMS KIT

V 291

### **EACH KIT CONTAINS:**

Samples, Prices, Order Form, 4 Checks, 2 Statements, 2 Invoices, Programming Guides.

We specialize in small quantities, low prices. 500 CHECKS ONLY \$29.95



### SEND COUPON, CIRCLE BINGO or PHONE TOLL FREE 1+800-225-9540

within 6 w	
VICE. IN	IC.



### El Monte, CA

Ohio Scientific specialist in the San Gabriel valley serving greater Los Angeles. Full product line on display. Specializing in business computers. In-house service. Custom programming. Terminals. Printers. Open Mon-Sat, 9 AM-7 PM. Computer & Video, 3380 Flair Dr., Suite 207, El Monte, CA 91731, 572-7292.

#### San Jose, CA

Bay area's newest computer store. Featuring the new Texas Instruments TI 99/4 home & business computer. Software for TRS-80, Apple, PET, etc. Magazines. Hobbi-Tronics, 1378. S. Bascom Ave., San Jose, CA 95128, 998-1103.

#### Santa Barbara, CA

Complete computer systems for business and personal use. Classes, seminars, word processing supplies, books, magazines. Computers Plus, 1827 State St., Santa Barbara, CA 93101, 963-4542.

#### N. Hollywood, CA

Wholesale prices to dealers & computer club members! Anadex, Atari, Base-2, Centronics, Emako, Godbout, Hazeltine, Lobo, Micropolis, MicroPro, NEC, Okidata, Paper Tiger, Soroc, Tarbell, Televideo, TI, Vector Graphic, Zenith & others. Patio Computer Sales Co., 5437 Laurel Canyon Bl., #208, N. Hollywood, CA 91607, 762-0020.

#### Sarasota, FL

Dynabyte computer systems, Hazeltine and NEC, Word-Star, Structured Systems accounting. Consulting, training, sales, service. Glisco, Inc., 4001 Roberts Point Rd., Sarasota, FL 33581, 349-0200.

#### Aurora, IL

Microcomputer systems for home or business; peripherals, software, books & magazines. Apple, Hewlett-Packard, North Star, Cromemco systems. IDS-440G printer w/Apple graphics, New HP-85 & HP calculators. Farnsworth Computer Center, 1891 N. Farnsworth Ave., Aurora, IL 60955, 851-3888.

#### Chicago, IL

Brand new lowest prices, never undersold, postpaid in USA—Teletype 43 keyboard printers, Okidata & Integral Data printers, Sc-50 bus computers, peripherals & business software. Data Mart, 914 East Waverly Street, Arlington Heights, IL 60004, 398-8525.

### Garden City, MI

Complete systems for business, professional and personal applications. Custom programming available. Apple II, North Star, Vector Graphic and other lines of microcomputers, software, books, components. Computer Center, 28251 Ford Rd., Garden City, MI 48135, 422-2570.

Dealers: Listings are \$15 per month in prepaid quarterly payments, or one yearly payment of \$150, also prepaid. Ads include 25 words describing your products and services plus your company name, address and phone. (No area codes or merchandise prices, please.) Call Marcia at 603-924-7138 or write Kilobaud Microcomputing, Ad Department, Peterborough, NH 03458.

#### Westland, MI

Integrated circuits, TTL, CMOS, linear. Many hard to find "S" and "LS" types. Resistors, capacitors, diodes, IC sockets and many other items. Westland Electronics, 34245 Ford Rd., Westland, MI 48185, 728-0650.

#### Hannibal, MO

Ohio Scientific products, modifications, service, software. 8" disk for C1p, C4p. Process control specialist. E&I Technical Service, 5300 Paris Gravel Road, Hannibal, MO 63401, 248-0084.

### St. Louis, MO

Experimenters' Paradise. Electronic and mechanical components. Computer People, Audio People, Hams, Robot Builders, Experimenters. Open six days a week. Gateway Electronics Corp., 8123-25 Page Blvd., St. Louis, MO 63130, 427-6116.

### Portland, OR

Ohio Scientific specialists for business and personal computers. Local service. Terminals, printers, custom programming. Full OSI product line on display! 10 AM to 6 PM M-F. Fial Computer, 11266 SE 21st Ave., Milwaukie, OR 97222, 654-9574.

We support Level II and Model II. Books, magazines, programs, parts, accessories, peripherals, free literature, free seminars, cassettes, floppies, filters, transformers, caps, chips, CRTs. Artco Electronics, 302 Wyoming Ave., Kingston, PA 18704, 287-1014.

Kingston, PA

#### Sara, Mexico

Learn how to utilize and program the Z-80 microprocessor to maintain your company's records in top shape. This technique has just been introduced to Mexico. Courses, applications, maintenance, service. **Digitales, S.A. de C.V. Sara 4612, Mexico 14, D.F., 5-17-41-59** 

## CLASSIFIEDS

Classified advertisements are intended for use by persons desiring to buy, sell or trade used computer equipment. No commercial ads are accepted.

Two sizes of ads are available. The \$5 box allows up to 5 lines of about 35 characters per line, including spaces and punctuation. The \$10 box allows up to 10 lines. Minimize use of capital letters to save space. No special layouts allowed. Payment is required in advance with ad copy. We cannot bill or accept credit.

Advertising text and payment must reach us 60 days in advance of publication (i.e., copy for March issue, mailed in February, must be here by Jan. 1). The publisher reserves the right to refuse questionable or inapplicable advertisements. Mail copy with payment to: Classifieds, Kilobaud Microcomputing, Peterborough NH 03458. Do not include any other material with your ad as it may be delayed.

For Sale: One Gimix computer nearly new, excellent condition. 6800 CPU card, 16K static memory card (Gimix). \$800. Paul Lamar, 123 S. Juanita St., Redondo Beach, CA 90277. Work 213-374-1673, home 213-316-8351.

For Sale: Smoke Signal Broadcasting disk controller card, with the following software: on 8" floppy disk, text editing system, disk file BASIC and mnemonic assembler. \$250. Paul Lamar, 123 S. Juanita St., Redondo Beach, CA 90277. Work 213-374-1673, home 213-316-8351.

Trade ham station for AIM 65. Also trading O.S.I. programs, etc. Write to Henry A. Etchason, Box 147, Sage, AR 72573.

TRS-80 Mod. I, Level I with Expansion Interface & 10 key, \$1000. IBM Selectric 71-3 I/O with TRS-80 print port interface, \$650. Will sell both for \$1400. D. Bowie, Box 3453, San Francisco, CA 94119, 415-861-6883.

For Sale: S. D. Expandoram, S-100, 16K with 4115s, assembled, never used. \$175 or best offer. Call 701-968-4525, or write T. Cartwright, Box 301, Cando, ND 58324.

For Sale: Back issues of Byte, all my beginning computer books and cassette learning tapes, assorted electronic books, etc. Send SASE for list to Don Hastings, Box 366, Hemingway, SC 29554.

For Sale: Heath H8 w/16K, H8-5. H9 w/ GRAFIX and page erase. Heath cassette recorder, software, complete documentation. Complete system, up and running, \$650. Dave Leupp, 852 Westover Terr., Whiteman AFB, MO 65305, 816-563-2208.

For Sale: TRS-80, Level II, 16K w/many extras, \$600. Mint condition. Kilobaud issues #1 to present. Best offer. Larry Guerrera, Box 933, Woodside, NY 11377, 212-545-4917.

For Sale: Eaton LRC 7000 + 64 char. printer, \$250. Radio Shack Quick Printer II, 32 char. (Cat. No. 26-1155), \$150. Send certified check or money order: Wm. R. Spencer, Jr., 5421 Grandin Rd. Ext., Salem, VA 24153.

Wanted: 610 expansion board for OSI C1P. With or without RAM chips. Send price and description to Gary Rinehart, RR#3, North Manchester, IN 46962.

For Sale—SWTP MP-16, 16K memory board, excellent condition. Paid over \$450. Will sell for \$299 or make offer. Call 702-453-4775 after 5 pm.

For Sale: SWTP 6800 w/32K, SSB dual disk drive, CT-64 & VM-64, Percom cassette interface, manual and software and extra scrial and parallel cards. \$3350. Will separate. John Rogers, 312-549-0008 after 5 pm.

For Sale: Unused Polymorphic System 8813 with 32K RAM memory with floppy-disk drives, printer interface and Abern-Sopher Multiwriter III. System has Canadian import tax paid. Offers for complete system to: Bishop Management, #8—825 McBride Blvd., New Westminster, B.C., Canada, V3L 5B5, 604-525-8148.

For Sale: MSI-6800 microcomputer with 16K + RAM, 8K PROM board, two serial ports, two cassette ports (J.P.C.), new Percom 5" disk with controller card, lots of disk software. This system has been used very little, \$1700. KIM-1 with enclosure and all manuals, \$110. Meca-Beta high-speed cassette recorder, 9600 baud, RS-232, \$325. Micon 32 char. terminal, 300 baud, RS-232, \$325. Everything for \$2300 and you ship. Bill Pinkerton, 129-2nd Ave., Indialantic, FL 32903, 305-725-7016.

PET 2nd cassette (\$60) + more PET equip. Lots of software + manuals. For sale (cheap!) or trade. Send SASE to D. Coles, 3713 Bay To Bay, Tampa, FL 33609.

Wanted: OSI b&w video board #540. If you upgraded to color you have one gathering dust. Mike Schroeder, 1251 Minnesota Ave., Detroit Lakes. MN 56501.

Sell: Heath system complete and assembled H8, H9, 40K memory, H17 disk, 2 drives, DEC writer, 2 cassette recorders. All programs documentation and disks. Only \$3500. Every item below kit price. E. McCormick, 8 Monmouth Shire Lane, Spring Lake, NJ 07762. 201-449-4093 after 7:00 pm.

### MICRO QUIZ

from page 19

Answer: 3

J=1 => X(7)=1J=2 => X(1)=2

J=3 => X(7)=3

J=4 => X(2)=4

J=5 => X(2)=5J=6 => X(1)=6

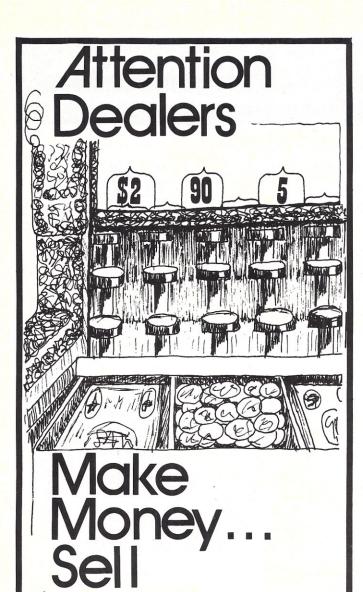
(The next quiz question tests your knowledge of digital electronics.)

For Sale: Xitan Z-80 system. Mainframe, ZPU, SMB, VDB, 48K RAM, 16K ROM (12K BASIC in ROM), keyboard, manuals, software. Complete system \$1800. Terry Young, 4 Aiken St., Derry, NH 03038, 603-434-0257.

Wanted: Synertek KTM-2 keyboard and/or Trendcom 200 printer. In return I will fabricate an equal value of prototype PC boards. R. Hegel, 7332 Portland Ave., Richfield, MN 55423.

TRS-80 Quick Printer-II plus nine rolls paper and cables for keyboard and expansion interface, \$180. Like new, list over \$240. G. Atkinson, Box 40387, San Francisco, CA 94140, 415-647-9122.

Diablo Hytype 1 Model 1200. Best of the "daisy whee!" printers. Brand new units w/pin feed friction platen & print wheel. Interface for Apple, TRS-80 & CP/M systems, maintenance manual and additional interface info available. There is no better buy anywhere. After 6 PM. Scott Priester, 211 White Water Ct., Greer, SC 29651, 803-268-0678.



kilobaud

### ROCOMPUTING

Selling Kilobaud MICROCOMPUTING, the most complete journal of microcomputing, brings the computer enthusiast through your door. Once he's in your store, you can sell him anything.

For information on selling Kilobaud MICROCOM-PUTING, call 603-924-7296 and speak with Ginnie Boudrieau, our bulk sales manager, or write to her at Kilobaud Microcomputing, 80 Pine Street, Peterborough, NH 03458.

Our dealers are telling us that Kilobaud MICRO-COMPUTING is the hottest-selling computer magazine on the newsstand, so call today and join the ranks of dealers who make money with KM.

MICROCOMPUTING T.M.

80 Pine Street, Peterborough NH 03458

### **TEXAS COMPUTER SYSTEMS** Radio Shaek

Authorized Sales Center, OFFERS > 328 LOWEST PRICES on

\$3349

Ask about the discounts/availability of the new Model III, Pocket Computer, Videotex, and other items, and our current price list.

Level II \$680

\$3349 items, and our current price list.

Level 11 \$680

Limited Time Only. Model II 64K \$3349. Model I 16K Level II w/keypad \$680., Model I 4K Level II \$545., Model I 4K Level I \$425. Expansion Interface no memory \$250. We strive to offer the lowest possible price to you. . Programs 12% off list. CALL US.

NEW single/DOUBLE DENSITY Modification for the Model I. Using our 40 track anti-crunch disk drives and this kit. 400k is available on the 2-drive system! Mix/copy single and DOUBLE DENSITY at the same time for complete compatability. Can use Flippy disks for greater savings. By Percom \$209. Disk Drives \$349 each.

SAVE \$70. Our 16K Memory kit \$79. each with instructions.

Expand your Level I 4K to Level II 16K (when converting to disks) for as low as \$129. CALL FOR DETAILS.

FOR 8" CP/M systems—Osborne General Ledger \$49. with multiple profit conterts \$99. A/R-A/P \$49. Pay-roll \$49. In three for \$100. Three w/ multiple profit G7. \$150. Support limited to copies and published errata information. Configured for Soroc and similar terminals. Manuals \$20 each.

\* No taxes on out-of-state shipments. Texas res. Add 55.

\* All merchandies is new, checked and guaranteed by manufacturer.

\* Payment: Money Order, Cashier's Check, Certified Check. Personal Checks require 3 weeks to clear.

\* YISA, MASTERCHARGE—Add 3%.

\* Prices subject to change at any time.

Prices subject to change at any time.

Delivery of merchandise is subject to availability.

UPS prepaid insured delivery: \$1-\$100, \$5; \$101-\$500, \$7; \$501 up, 1.5% of order. Model II must be shipped by truck. Rate Exception: furniture and some large items. Texas Residents 915-597-0673

TCS, 106 East 10th, Brady, TX 76825. 800-351-1473

### IN STOCK FOR IMMEDIATE SHIPMENT

### **16K MEMORY KITS \$49.95**

4116's 6 MONTH WARRANTY INSTRUCTIONS INCLUDED

### DISK DRIVES

PERCOM TFD-100 \$325 **PERCOM TFD-200 \$595** CCI-100 \$305 CCI-200 \$495

2 DRIVE CABLE \$24.95 4 DRIVE CABLE \$34.95

### **PRINTERS \$695**

MICROTEK MT80P BI-DIRECTIONAL 125 CPS UPPER & LOWER CASE

**1 YEAR WARRANTY** CABLE-\$24.95

### DISKETTES

MEMOREX OR BASF 10/\$26.50 YOUR SATISFACTION GUARANTEED OR FULL REFUND

MICROCOMPUTER SERVICES CORPORATION

7314 MATTHEWS-MINT HILL RD. CHARLOTTE, NC 28212

V 344

\*TRADEMARK TANDY/RADIO SHACK CORP. PERCOM TM PERCOM DATA CCI TM CPU IND.

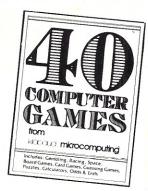
545-0826

### kb microcomputing book nook

## 2 NEW BOKS FROM KB MICROCOMPUTING



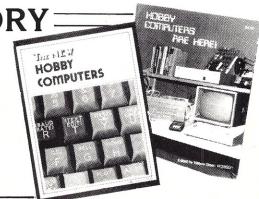
● 40 COMPUTER GAMES—BK7381—Forty games in all in nine different categories. Games for large and small systems, and even a section on calculator games. Many versions of BASIC used and a wide variety of systems represented. A must for the serious computer gamesman. \$7.95\*



● UNDERSTANDING AND PROGRAMMING MICROCOMPUTERS — BK7382—A valuable addition to your computing library. This two part text includes the best articles that have appeared in 73 and Kilobaud Microcomputing magazines on the hardware and software aspects of the new microcomputing hobby. Well known authors and well structured text helps the reader get involved in America's fastest growing hobby. \$10.95\*

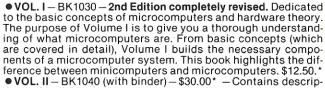
### INTRODUCTORY

- HOBBY COMPUTERS ARE HERE!—BK7322—If you (or a friend) want to come up to speed on how computers work . . . hardware and software . . . this is an excellent book. It starts with the fundamentals and explains the circuits, and the basics of programming. This book has the highest recommendations as a teaching aid for newcomers. \$4.95.\*
- THE NEW HOBBY COMPUTERS—BK7340—This book takes it from where "HOBBY COMPUTERS ARE HERE!" leaves off, with chapters on Large Scale Integration, how to choose a microprocessor chip, an introduction to programming, low cost I/O for a computer, computer arithmetic, checking memory boards . . . and much, much more! Don't miss this tremendous value! Only \$4.95.\*



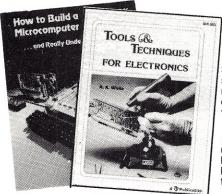
### LINTRODUCTION TO MICROCOMPUTERS (VOL. 0→III)

•AN INTRODUCTION TO MICROCOMPUTERS, VOL. 0—BK1130—The Beginner's Book—Written for readers who know nothing about computers—for those who have an interest in how to use computers—and for everyone else who must live with computers and should know a little about them. The first in a series of 4 volumes, this book will explain how computers work and what they can do. Computers have become an integral part of life and society. During any given day you are affected by computers, so start learning more about them with Volume 0. \$7.95.\*



◆VOL. II – BK1040 (with binder) – \$30.00\* – Contains descriptions of individual microprocessors and support devices used only with the parent microprocessor. Volume II describes all available chips

● VOL. III — BK1133 (with binder) — \$20.00.\* Contains descriptions of all support devices that can be used with any microprocessor



- HOW TO BUILD A MICROCOMPUTER AND REALLY UNDERSTAND IT BK7325 by Sam Creason. The electronics hobbyist who wants to build his own microcomputer system now has a practical "How-To" guidebook. This book is a combination technical manual and programming guide that takes the hobbyist step-by-step through the design, construction, testing and debugging of a complete microcomputer system. Must reading for anyone desiring a true understanding of small computer systems. \$9.95.\*
- TOOLS & TECHNIQUES FOR ELECTRONICS BK7348 by A. A. Wicks is an easy-to-understand book written for the beginning kit builder as well as the experienced hobbyist. It has numerous pictures and descriptions of the safe and correct ways to use basic and specialized tools for electronic projects as well as specialized metal working tools and the chemical aids which are used in repair shops. \$4.95.\*

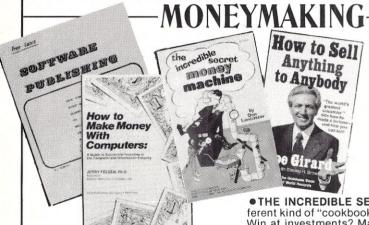
\*Use the order card in the back of this magazine or itemize your order on a separate piece of paper and mail to Kilobaud *Microcomputing* Book Department • Peterborough NH 03458. Be sure to include check or detailed credit card information. No C.O.D. orders accepted. All orders add \$1,00 handling. Please allow 4–6 weeks for delivery. Questions regarding your order? Please write to Customer Service at the above address.

### kb microcomputing book nook

### SPECIAL INTERESTS



- TRS-80 DISK AND OTHER MYSTERIES BK1181 by Harvard C. Pennington. This is the definitive work on the TRS-80 disk system. It is full of detailed "How to" information with examples, samples and in-depth explanations suitable for beginners and professionals alike. The recovery of one lost file is worth the price alone. \$22.50.\*
- ●INTRODUCTION TO TRS-80 GRAPHICS BK1180 by Don Inman. Dissatisfied with your Level I or Level II manual's coverage of graphics capabilities? This well-structured book (suitable for classroom use) is ideal for those who want to use all the graphics capabilities built into the TRS-80. A tutorial method is used with many demonstrations. It is based on the Level I, but all material is suitable for Level II use. \$8.95.\*
- MICROPROCESSOR INTERFACING TECHNIQUES BK1037 by Austin Lesea & Rodnay Zaks will teach you how to interconnect a complete system and interface it to all the usual peripherals. It covers hardware and software skills and techniques, including the use and design of model buses such as the IEEE 488 or \$100. \$15.95.\*
- MICROPROCESSOR LEXICON ACRONYMS AND DEFINITIONS BK1137 Compiled by the staff of SYBEX is a convenient reference in pocket size format. Sections include acronyms and definitions, part numbers and their definitions, S-100 signals, RS232 signals, IEEE 499 signals, microcomputer and microprocessors, JETDS summary (military) and a code conversion table. \$2.95.\*
- MICROPROCESSORS FROM CHIPS TO SYSTEMS BK1036—by Rodnay Zaks is a complete and detailed introduction to microprocessors and microcomputer systems. No preliminary knowledge of computers or microprocessors is required to read this book, although a basic engineering knowledge is naturally an advantage. Intended for all wishing to understand the concepts, techniques and components of microprocessors in a short time. \$10.95.\*

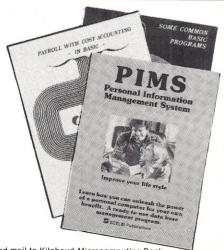


- HOW TO MAKE MONEY WITH COMPUTERS—BK1003—In 10 information-packed chapters, Jerry Felsen describes more than 30 computer-related, money-making, high profit, low capital investment opportunities. \$15.00.\*
- HOW TO SELL ANYTHING TO ANYBODY BK7306 According to *The Guinness Book of World Records*, the author, Joe Girard, is "the world's greatest salesman." This book reveals how he made a fortune and how you can, too. \$2.25.\*
- FREELANCE SOFTWARE PUBLISHING BK1179 by B. J. Korites. "This book is about money and how to make it by writing and selling computer programs," (author's foreword). If you have the skills to write a saleable program, you now need to acquire the skills to sell that program. This compact book comprehensively covers the entire publishing process and many aspects of software salesmanship. \$14.95.\*

●THE INCREDIBLE SECRET MONEY MACHINE—BK1178—by Don Lancaster. A different kind of "cookbook" from Don Lancaster. Want to slash taxes? Get free vacations? Win at investments? Make money from something that you *like* to do? You'll find this book essential to give you the key insider details of what is really involved in starting up your own money machine. \$5.95.\*

### BUSINESS-

- PAYROLL WITH COST ACCOUNTING IN BASIC BK1001—by L. Poole & M. Borchers, includes program listings with remarks, descriptions, discussions of the principle behind each program, file layouts, and a complete user's manual with step-by-step instructions, flowcharts, and simple reports and CRT displays. Payroll and cost accounting features include separate payrolls for up to 10 companies, time-tested interactive data entry, easy correction of data entry errors, job costing (labor of distribution), check printing with full deduction and pay detail, and 16 different printed reports, including W-2 and 941 (in CBASIC). \$20.00.\*
- SOME COMMON BASIC PROGRAMS—BK1053—published by Adam Osborne & Associates, Inc. Perfect for non-technical computerists requiring ready-to-use programs. Business programs, plus miscellaneous programs. Invaluable for the user who is not an experienced programmer. All will operate in the stand-alone mode. \$12.50 paperback.\*
- PIMS: PERSONAL INFORMATION MANAGEMENT SYSTEM BK1009 Learn how to unleash the power of a personal computer for your own benefit in this ready-to-use data-base management program. \$11.95.\*



\*Use the order card in the back of this magazine or itemize your order on a separate piece of paper and mail to Kilobaud *Microcomputing* Book Department • Peterborough NH 03458. Be sure to include check or detailed credit card information. No C.O.D. orders accepted. All orders add \$1.00 handling. Please allow 4-6 weeks for delivery. Questions regarding your order? Please write to Customer Service at the above address.

### kb microcomputing book nook



-280new! • INSIDE LEVEL II - BK1183 - For machine language programmers! This is a comprehensive reference guide to the Level II ROMs, allowing easy utilization of the sophisticated routines they contain. It concisely explains set-ups, calling sequences, variable passage and I/O routines. Part II presents an entirely

new composite program structure which unloads under the SYSTEM command and executes in both BASIC and machine code with the speed and efficiency of a compiler. Special con-

sideration is given to disk systems. \$15.95.

• PROGRAMMING THE Z-80 - BK1122 - by Rodnay Zaks. Here is assembly language programming for the Z-80 presented as a progressive, step-by-step course. This book is both an educational text and a self-contained reference book, useful to both the beginning and the experienced programmer who wish to learn about the Z-80. Exercises to test the reader are included. \$14.95.

- Z-80 ASSEMBLY LANGUAGE PROGRAMMING BK1177 by Lance A. Leventhal. This book thoroughly covers the Z80 instruction set, abounding in simple programming examples which illustrate software development concepts and actual assembly language usage. Features include Z80 I/O devices and interfacing methods, assembler conventions, and comparisons with 8080A/8085 instruction sets and interrupt structure.
- Z-80 SOFTWARE GOURMET GUIDE AND COOKBOOK BK1045 by Nat Wadsworth. Scelbi's newest cookbook! This book contains a complete description of the powerful Z-80 instruction set and a wide variety of programming information. Use the author's ingredients including routines, subroutines and short programs, choose a time-tested recipe and start cooking! \$15.95.\*

-6502-

- PROGRAMMING THE 6502 (Second Edition) BK1005 -Rodnay Zaks has designed a self-contained text to learn programming, using the 6502. It can be used by a person who has never programmed before, and should be of value to anyone using the 6502. The many exercises will allow you to test yourself and practice the concepts presented. \$12.95.
- ●6502 APPLICATIONS BOOK BK1006 Rodnay Zaks presents practical-application techniques for the 6502 microprocessor, assuming an elementary knowledge of microprocessor programming. You will build and design your own domestic-use systems and peripherals. Self-test exercises
- •6502 ASSEMBLY LANGUAGE PROGRAMMING BK1176 by Lance A. Leventhal. This book provides comprehensive coverage of the 6502 microprocessor assembly language. Leventhal covers over 80 programming examples from simple memory load loops to complete design projects. Features include 6502 assembler conventions, input/output devices and interfacing methods, and programming the 6502 interrupt system. \$12.50.\*
- ●6502 SOFTWARE GOURMET GUIDE AND COOKBOOK-BK1055 - by Robert Findley. This book introduces the BASIC language programmer into the realm of machine-language programming. The description of the 6502 structure and instruction set, various routines, subroutines and programs are the ingredients in this cookbook. "Recipes" are included to help you put together exactly the programs to suit your taste. \$12.95.

• 8080A/8085 Assembly Language Programming—by Lance Leventhal—BK1004—Assembly language programming for the 8080A/8085 is explained with a description of the functions of assemblers and assembly instructions, and a discussion of basic software development concepts. Many fully debugged, practical programs are included as is a special section on structured programming. \$12.50.

-8080 / 8080A-

COOKBOOK

● 8080 PROGRAMMING FOR LOGIC DESIGN—BK1078—Ideal reference for an indepth understanding of the 8080 processor. Application-oriented and the 8080 is discussed in light of replacing conventional, hard-wired logic. Practical design considerations are provided for the implementation of an 8080-base control system, \$9.50.

●8080 SOFTWARE GOURMET GUIDE AND COOKBOOK — BK1102—If yu have been spending too much time developing simple routines for your 8080, try this new book by Scelbi Computing and Robert Findley. Describes sorting, searching, and many other routines for the 8080 user. \$12.95.\*

#### -6800-

- 6800 PROGRAMMING FOR LOGIC DESIGN-BK1077-Oriented toward the industrial user, this book describes the process by which conventional logic can be replaced by a 6800 microprocessor. Provides practical information that allows an experimenter to design a complete micro control system from the "ground up." \$9.50.\*
- ●6800 SOFTWARE GOURMET GUIDE AND COOKBOOK BK1075 - Like its culinary cousin, The 8080 Gourmet Guide, this book by Scelbi Computing and Robert Findley describes sorting, searching and other routines—this time for the 6800 user. \$12.95.\*

#### -COOK BOOKS-

- CMOS COOKBOOK BK1011 by Don Lancaster. Details the application of CMOS, the low power logic family suitable for most applications presently dominated by TTL. Required reading for every serious digital experimenter! \$10.50.\*
- TVT COOKBOOK BK1064 by Don Lancaster. Describes the use of a standard television receiver as a microprocessor CRT terminal. Explains and describes character generation, cursor control and interface information in typical, easy-tounderstand Lancaster style. \$9.95.
- TTL COOKBOOK BK1063 by Donald Lancaster. Explains what TTL is, how it works, and how to use it. Discusses practical applications, such as a digital counter and display system, events counter, electronic stopwatch, digital voltmeter and a digital tachometer. \$9.50.
- MICROCOMPUTING CODING SHEETS Microcomputing's dozen or so programmers wouldn't try to work without these handy scratch pads, which help prevent the little errors that can cost hours and hours of programming time. Available for programming is Assembly/Machine Language (PD1001), which has columns for address, instruction (3 bytes), source code (label, op code, operand) and comments; and for BASIC (PD1002) which is 72 columns wide. 50 sheets to a pad. \$2.39.

\*Use the order card in the back of this magazine or itemize your order on a separate piece of paper and mail to Kilobaud Microcomputing Book Department • Peterborough NH 03458. Be sure to include check or detailed credit card information. No C.O.D. orders accepted. All orders add \$1.00 handling. Please allow 4-6 weeks for delivery. Questions regarding your order? Please write to Customer Service at the above address.

### kb microcomputing book nook

### BASIC AND PASCAL

#### **NEW REVISED EDITION**

● PROGRAMMING IN PASCAL—BK1140—by Peter Grogono. The computer programming language PASCAL was the first language to embody in a coherent way the concepts of structured programming, which has been defined by Edsger Dijkstra and C.A.R. Hoare. As such, it is a landmark in the development of programming languages. PASCAL was developed by Niklaus Wirth in Zurich; it is derived from the language ALGOL 60 but is more powerful and easier to use. PASCAL is now widely accepted as a useful language that can be efficiently implemented, and as an excellent teaching tool. It does not assume knowledge of any other programming language; it is therefore suitable for an introductory course. \$12.95.\*

● THE BASIC HANDBOOK—BK1174—by David Lien. This book is unique. It is a virtual ENCYCLOPEDIA of BASIC. While not favoring one computer over another, it explains over 250 BASIC words, how to use them and alternate strategies. If a computer does not possess the capabilities of a needed or specified word, there are often ways to accomplish the same function by using another word or combination of words. That's where the HANDBOOK comes in. It helps you get the most from your computer, be it a "bottom-of-the-line" micro or an oversized monster. \$14.95.\*



● LEARNING LEVEL II — BK1175 — by David Lien. Written especially for the TRS-80, this book concentrates on Level II BASIC, exploring every important BASIC language capability. Updates are included for those who have studied the Level I User's Manual. Sections include: how to use the Editor, dual cassette operation, printers and peripheral devices, and the conversion of Level I programs to Level II. \$15.95.\*



• BASIC NEW 2ND EDITION — BK1081 — by Bob Albrecht. Self-teaching guide to the computer language you will need to know for use with your microcomputer. This is one of the easiest ways to learn computer programming. \$6.95.\*

● BASIC BASIC (2ND EDITION) — BK1026 — by James S. Coan. This is a textbook which incorporates the learning of computer programming using the BASIC language with the teaching of mathematics. Over 100 sample programs illustrate the techniques of the BASIC language and every section is followed by practical problems. This second edition covers character string handling and the use of data files. \$9.45.\*

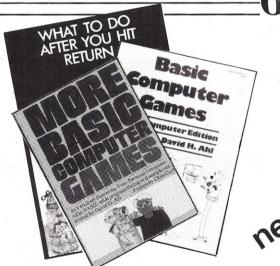
• ADVANCED BASIC – BK1000 – Applications, including strings and files, coordinate geometry, area, sequences and series, simulation, graphing and games. \$9.65\*.

• MY COMPUTER LIKES ME...WHEN I SPEAK BASIC – BK1039 – An introduction to BASIC ...simple enough for kids. If you want to teach BASIC to anyone quickly, this is the way to go. \$3.95.\*

• SIXTY CHALLENGING PROBLEMS WITH BASIC SOLUTIONS (2nd Edition) — BK1073 — by Donald Spencer, provides the serious student of BASIC programming with interesting problems and solutions. No knowledge of math above algebra required. Includes a number of game programs, as well as programs for financial interest, conversions and numeric manipulations. \$6.95.\*







- WHAT TO DO AFTER YOU HIT RETURN BK1071 PCC's first book of computer games . . . 48 different computer games you can play in BASIC . . . programs, descriptions, many illustrations. Lunar Landing, Hammurabi, King, Civel 2, Qubic 5, Taxman, Star Trek, Crash, Market, etc. \$10.95.\*
- BASIC COMPUTER GAMES BK1074 Okay, so once you get your computer and are running in BASIC, then what? Then you need some programs in BASIC, that's what. This book has 101 games for you from very simple to real buggers. You get the games, a description of the games, the listing to put in your computer and a sample run to show you how they work. Fun. Any one game will be worth more than the price of the book for the fun you and your family will have with it. \$7.50.\*
- MORE BASIC COMPUTER GAMES BK1182 edited by David H. Ahl. More fun in BASIC! 84 new games from the people who brought you BASIC Computer Games. Includes such favorites as Minotaur (battle the mythical beast) and Eliza (unload your troubles on the doctor at bargain rates). Complete with game description, listing and sample run. \$7.50.\*

\*Use the order card in the back of this magazine or itemize your order on a separate piece of paper and mail to Kilobaud *Microcomputing* Book Department

• Peterborough NH 03458. Be sure to include check or detailed credit card information. No C.O.D. orders accepted. All orders add \$1.00 handling.

Please allow 4–6 weeks for delivery. Questions regarding your order? Please write to Customer Service at the above address.



Comes with Backgammon and Tic-Tac-Toe on tape with full documentation and program list-ing. Requires 9v. battery. Part No. IBEX \$19.95

APPLE II HOBBY/ PROTOTYPING CARD Part No. 7907 \$14.95

#### **APPLE II** PARALLEL INTERFACE



Interfaces printers, synthesizers keyboards, and JBE A-D D-A Converter & Switches. This inter-face has 4 I/O ports with handshaking logic, 2-6522 VIA's and a 74LS74 for timing. Inputs and outputs are TTL compatible. Part No. 79295K Complete Kit—\$69.95 • Part No. 79295A Assembled-\$79.95

#### **REAL TIME** 100,000 DAY CLOCK

MT. HARDWARE Double the utility of your S-100 bus computer with a real-time clock that keeps time in 100µS increments for over 273 years. Program events for the entire period with real time interrupts...without derailing the system. Maintain a log of computer usage, time and date transaction printouts, call up lists. On-board battery backup. MHPX004—\$349.00

#### **16K EPROM**



Uses 2708 EPROMS. memory speed selection provided, addressable anywhere in 65K of memory, can be shadowed in 4K increments. Board only \$24.95 part no. 7902, with parts less EPROMs \$49.95 part no. 7902A.

#### PET COMPUTER



With 16K & monitor-\$895.00 • Dual Disk Drive -\$1095.00

#### **OPTO-ISOLATED PARALLEL INPUT BOARD FOR APPLE II**



There are 8 inputs that can be driven from TTL logic or any 5 volt source. The circuit board can be plugged into any of the 8 sockets of your Apple II. It has a 16 pin socket for standard dip ribbon cable connection. Board only \$15.00. Part No. 120, with parts \$69.95. Part No. 120A.

#### **VIDEO TERMINAL**



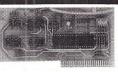
16 lines, 64 columns • Upper and lower case • 5x7 dot matrix • Serial RS-232 in and out with TTL parallel keyboard input . On board baud rate generator 75, 110, 150, 300, 600, & 1200 jumper select-able • Memory 1024 characters (7-21L02) Video processor chip SFF96364 by Necu-Ionic • Control characters (CR, LF, →, ←, 1, 1, non destructive cursor, CS, home, CL White characters on black background or vice-versa • With the addition of a keyboard, video monitor or TV set with TV interface (part no. 107A) and power supply this is a complete stand alone plete stand alone terminal • also S-100 compatible • requires +16, & -16 VDC at 100mA, and 8VDC at Part No. 1000A \$199.95 kit.

#### PARALLEL TRIAC OUTPUT **BOARD FOR APPLE II**



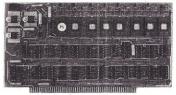
This board has 8 triacs capable of switching 110 volt 6 amp loads (660 watts per channel) or a total of 5280 watts. Board only \$15.00 Part No. 210, with parts \$119.95 Part No. 210A

#### APPLE II\* SERIAL I/O INTERFACE



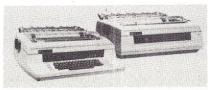
Baud rate is continuously adjustable from O to 30,000 • Plugs into any peripheral connector • Low current drain. RS-232 input and output • On board switch selectable 5 to 8 data bits, 1 or 2 stop bits, and parity or no parity either odd or even • Jumper selectable address • SOFTWARE • Input and Output routine from monitor or BASIC to teletype or other serial printer • Program for using an Apple II for a video or an intelligent terminal Also can output in correspondence code to interface with some selectrics. • Also watches DTR • Board only \$15.00 Part No. 2, with parts \$42.00 Part No. 2A, assembled \$62.00 Part No. 20

#### **8K EPROM PICEON**



 Programs 2708's address relocation of each 4K of memory to any 4K boundary Power on jump and reset jump option for "turnkey" systems and computers without a front panel Program saver software in 1 2708 EPROM \$25. Bare board \$35 including custom coil, board with parts but no EPROMS\$139, with 4 EPROMS \$179, with 8 EPROMS \$219.

#### **SPINWRITER** MODELS 5510 and 5520



Features—EIA RS-232C/CCITT V.24 Interface Standard • 55 Characters Per Second Maximum Print Rate • Impeccable Print Quality (OCR Quality) • Microprocessor Electronics • High Resolution Plotting/Graphing • Lowest Operating Noise Level • Self-Test Printing • Operator Engineered Control Panel • Prints Original and up to Seven Copies • NEC Information Systems new Model 5510 Receive Only and Model 5520 Keyboard Send/Receive SPIN-WRITER terminals are microprocessor controlled serial, impact terminals designed for remote printing applications where impeccable print quality is required. Model 5510 RO, Part No. NECA30759 \$2795.95 • Model 5520 KSR, Part No. NECA30762 \$3095.95

#### **D.C. HAYES MICROMODEM**



Fully S-100 bus compatible including 16-bit machines and 4 MHz processors. • Two soft-ware selectable Baud rates—300 Baud and a jumper selectable speed from 45 to 300 Baud. (110 standard). Supports originate and answer modes. • Direct-connect Microcoupler. This FCC-registered device provides direct access into your local telephone system, with none of the losses or distortions associated with acoustic couplers and without a telephone company supplied data access arrangement. • Auto-Answer/Auto-Call. The MICHOMODEM 100 can automatically answer the phone and receive input; it can also dial a number automatically. • Automatic Reset and Disconnect. • Software compatible with the D.C. Hayes Associates 80-103A Data Communications Adapter. Micromodem-DCHA32625-\$379.95

#### TIDMA



Tape Interface Direct Memory Access ● Record and play programs without bootstrap loader (no prom) has FSK encoder/decoder for direct connections to low cost recorder at 1200 baud rate, and direct connections for inputs and outputs to a digital recorder at any baud rate ● S-100 bus compatible ● Board only \$35.00 Part No. 112, with parts \$110.00 Part No. 112A.

#### SYSTEM MONITOR

8080, 8085, or Z-80 System monitor for use with the TIDMA board. There is no need for the front panel. Complete with documentation \$12.95.

#### **RS-232/TTY** INTERFACE



This board has two active circuits, one converts RS-232 to 20 mA the other converts 20 mA to RS-232. Requires +12 and -12 volts. \$9.95 Part No.

#### SERIAL I/O



Four Serial I/O RS-232 ports. S-100 Bus, Software or jumper selectable baud rate (110, 300, 600, 1200, 2400, 4800, 9600 19.2K), on board Xtal baud rate generator, Address-ing, switch selectable, Parity or no parity (odd or even) switch selectable. 1 2 stop bits, 5 to 8 bits/character. Board only \$29.95, Part No. 7908 With parts (kit) \$199.95, Part, No. 7908A

#### S-100 BUS **ACTIVE TERMINATOR**



Board only \$14.95 Part No. 900, with parts \$24.95 Part No. 900A

#### Send for FREE Catalog...a big self addressed envelope with 80¢ postage gets it fastest!



Mention part no., description, and price. In USA shipping paid by us for orders accompanied by check or money order. We accept C.O.D. orders (U.S. only) or a VISA or Master Charge no., expiration date, signature and phone no., shipping charges will be added. CA residents add 6.5% for tax. Outside USA add 15% for air mail postage and handling. Payment must be in U.S. dollars. Dealer inquiries invited. Prices subject to change without notice.

Order Line: (408) 448-0800

### ELECTRONIC SYSTEMS Dept.KB,P.O. Box 21638, San Jose, CA USA 95151

#### **HEX ENCODED KEYBOARD**

Four onboard LEDs indicate the HEX code generated for each key depression. The board single volt supply. Board only \$15.00 Part No. HEX-3, with parts \$49.95 Part No. HEX- 3A. 44 pin edge connector \$4.00 Part No. 44P.



#### T.V. **TYPEWRITER**



Stand alone TVT 32 char/line, 16 lines, modifications for 64 char/line included ● Parallel ASCII (TTL) input ● Video output 1K on board memory Output for computer controlled curser Auto scroll . Nondestructive curser Curser inputs: up, down, left, right, home, EOL, EOS • Scroll up, down • Requires +5 volts at 1.5 amps, and -12 volts at 30 mA • All 7400, TTL chips • Char. gen. 2513 • Upper case only • Board only \$39.00 Part No. 106, with parts \$145.00 Part

#### 44 BUS MOTHER BOARD



Has provisions for ten 44 pin (.156) connectors, spaced 3/4 of an inch apart. Pin 20 is connected to X, and 22 is connected to Z for power and ground. All the other pins are connected in parallel. This board also has provisions for bypass capacitors. Board cost \$15.00 Part No. 102 Connectors \$3.00 each Part No.

#### UART & **BAUD RATE GENERATOR**



 Converts serial to parallel and parallel to serial • Low cost on board baud rate generator • Baud rates: 110, 150, 300, 600, 1200, and 2400 • Low power drain +5 volts and -12 volts required ● TTL com-patible ● All characters contain a start bit, 5 to 8 data bits, 1 or 2 stop bits, and either odd or even parity. • All connections go to a 44 pin gold plated edge connector ● Board only \$12.00 Part No. 101, with parts \$35.00 Part No. 101A, 44 pin edge connector \$4.00 Part

#### RS-232/20mA INTERFACE



This board has two passive, opto-isola-ted circuits. One con-20mA, the other converts 20mA to RS-232. All connections go to a 10 pin edge connector. Requires +12 and -12 volts. Board only \$9.95, part no. 7901, with parts \$14.95 Part parts \$14 No. 7901A.

#### **ASCII TO CORRESPONDENCE CODE CONVERTER**

This bidirectional board is a direct replacement for the board inside the Trendata 1000 terminal. The on board connector provides BS-232 serial in and out. Sold only as an assembled and tested unit for \$249.95. Part No. TA 1000C

#### **ASCII KEYBOARD**

53 Keys popular ASR-33 format • Rugged G-10 P.C. Board • Tri-mode MOS encoding Two-Key Rollover • MOS/DTL/TTL Compat ible • Upper Case lockout • Data and Strobe inversion option • Three User Definable Keys • Low contact bounce • Selectable Par ity • Custom Keycaps • George Risk Model 753. Requires +5, -12 volts. \$59.95 Kit.

#### **ASCII KEYBOARD**

TTL & DTL compatible • Full 67 key array
• Full 128 character ASCII output • Positive
logic with outputs resting low • Data Strobe
• Five user-definable spare keys • Standard 22 pin dual card edge connector • Requires +5VDC, 325 mA. Assembled & Tested. Cherry Pro Part No. P70-05AB. \$119.95.



#### A-to-D D-to-A CONVERTER



Analog to Digital, Digital to Analog Converter: A-D con version time 20us. D-A conversion 5us. Uses include speech and music synthesizing and slow scan TV. Sin-

gle power supply (5V), 8 Bits wide, latched I/O, strobe lines. Part No. 79287K Complete Kit \$49.95 • Part No. 79287A Assembled \$69.95

#### **SOLID STATE SWITCH**





Your computer can control power Your computer can control power (120VAC) to your printer, lights, and other 120VAC appliances up to 720 watts (6AMPS at 120VAC). Input 3 to 15 VDC, 2-13 MA TTL compatible, isolation 1500V. Part No. 79000K 1 Channel Kit \$9.95 • Assm. \$12.50 • Part No. 79004K 4 Channel Kit \$34.95 • Assm. \$44.95.

#### SUPER MODEM



Orignate, RS-232 and 20 mA compatable, Full duplex, and half duplex, direct connect or acoustic coupled, on

board power supply, car-rier detect light, DB25 plug , 300 BAUD, Type 103 compatable frequencies, Bare board Part No. 2000, \$19,95, Kit Part No. 2000A, \$99.95

#### T.V. INTERFACE



Converts video to AM modulated RF Channels 2 or 3. So powerful almost no tuning is required. On board regulated power supply makes this extremely stable. Rated very highly in Doctor Dobbs' Journal. Recommended by Apple Power required is 12 volts AC C.T., or +5 volts DC 

Board only \$7.60 part No. 107, with parts \$13.50 Part

#### SOROC IQ 120



Upper/lower case dis-Upper/ lower case uisplay • Numeric keypad & cursor keys • Protected fields, ½ intensity display • R\$ 232 interface & aux. port. IQ120—\$799.95 • IQ140 Detachable key IQ140 Detachable keyboard-\$1199.95

#### RS-32/TTL INTERFACE



 Converts TTL to RS 232 to TTL . Two separate circuits • Requires -12 and +12 volts ● All connections go to a 10 pin edge connector, kit \$9.95 Part No. 232A 10 Pinedge connector \$3.00 part No. 10P.

#### TAPE INTERFACE



Converts a low cost tape recorder to a digital recorder • Works up to 1200 baud . Digital in and out are TTLserial • Output of board connects to mic. in of recorder • Earphone of recorder connects to input on board No coils • Requires +5 volts, low power drain • Board only \$7.60 Part No. 111, with parts \$29.95Part No. 111A

#### MODEM



● Type 103 ● Full or half duplex • Works up to 300 baud ● Originate or Answer ● Serial TTL input and output • connect 8  $\Omega$  speaker and crystal mic. directly to board Requires +5 volts • Board only \$7.60 Part No. 109, with parts \$29.95 Part No. 109A

#### COMPUCOLOR II



With reg. keyboard MOD3 8K \$1449.95 MOD4 16 K \$1495.95 MOD5 32K \$1699.95 Without disk drive subtract \$450.00. Add-on drives, \$495.00. With 101 key option add \$134.95. With 117 key option add \$179.95.

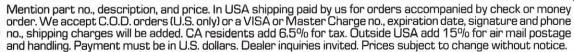
#### DC POWER SUPPLY

Board supplies a regulated +5 volts at 3 amps., +12, -12, and -5 volts at 1 amp. ● Power required is 8 volts AC at 3 amps., and 24 volts AC C.T. at 1.5 amps. • Board only \$12.50 Part No. 6085, with parts excluding transformers \$42.50 Part No. 6085A



Send for FREE Catalog...a big self addressed envelope with 80¢ postage gets it fastest!

### To Order:



Order Line: (408) 448-0800

ELECTRONIC SYSTEMS Dept.KB,P.O. Box 21638, San Jose, CA USA 95151

SEND FOR OUR FREE CATALOG

lets you put 'em on trial

CompuMart has been selling computers by mail since 1971. Our thousands of satisfied customers rely on CompuMart for services not generally available from the others. Namely:

- · Product Selection/Each product advertised by CompuMart has been evaluated by our in-house staff for best price, performance, and supplier reliability
- · Return Privilege/After receipt of our products, you are protected by Compu-Mart's exclusive, 10-day return privi-

ledge- good for all products except software

- · Support/Our Customer Service Dept. and expert technicians are always there to assist you by phone or at Compu-Mart's outlets. Our knowledgeable phore sales force can provide you with detailed information and complete product specifications.
- · Phone Ordering/For added convenience, CompuMart maintains a toll-free ordering number. 1-800-343-5504.

#### with 10 day free return

#### Printers=

#### The Paper Tiger **Printer From** Integral Data

Uses standard % inch ro!I paper and ribbon 40 characters per line Speed: 40 characters per second UL approved

High resolution dot matrix impact printer

IDS Paper Tiger Printer
IDS Graphics Paper Tiger Printer

#### **NEW!** From Integral Data. The IDS 460.

We saw this new desktop printer at the NCC 80 and when we saw its features: Correspondence quality printing, High-resolution graphics capability, programmable print control functions, and automatic text justification - we knew that we had to offer this printer to our cost/features conscious customers \$1,295

The Omni 810 Printer from **Texas Instruments** 

TI Omni 820 Receive-Only (RO) Package. Includes machine-mounted paper tray and cable. A compressed print option and device forms control are standard features

CENTRONICS PRINTERS

New! The incredible Model 737- Correspondence and Draft Quality Printing for Under \$1,000. This is the first printer in its class to offer print quality suitable for text processing, plus the performance and application flexibility required for data processing

737-3 (Serial Interface)

Tractor Feed Printer- Centronics' Most Popular Model. Perfect for the needs of a small business sytesm. Recommended by Apple and Radio Shack. \$1,079

NEC The First Name in Letter Quality Printers.

CompuMart offers beautiful print quality with NEC Spinwriter terminals. The Spinwriters, both KSR and RO versions, give unsurpassed hard copy output. CompuMart

offers a complete range of NEC Spin-writers—Call our expert salesforce



pad and an EIA cable with autospeed select. \$2,395

#### **Monitors**

#### **EXCLUSIVE from CompuMart!** Special Offer. Zenith Color Video

Monitor for \$379! COMPUMART NOW OFFERS THE BELIVERY LINE The perfect monitor for Apple, Atari and Texas Instruments owners.

NEW FROM SANYO — Four Great Monitors at Low CompuMart Prices.

Sanyo's new line of CRT data display monitors are specifically designed for the display of alphanumeric or graphic data.

9" Sanyo Monitor \$169 12" Sanvo Monitor \$289 \$299 12" Sanyo Monitor with green screen 13" Sanyo Color Display Monitor \$495



#### -Terminals

#### Televideo 912C

820 x 24-Lower case descenders. Teletype or telewriter keyboard. 110/220 VAC. 50 to 19.2K Baud Item entry pad. Great looking and no fan

#### Televideo 920C

Similar to the TV 912 but has programmable function keys across top. Excellent for text editing.

Call for Introductory Sale Prices



We've got the following Lear Siegler Terminals In Stock at prices too low to print - Call for quotes. ADM-3A Industries favorite dumb terminal for

some very smart reasons.

ADM-3A. + New from Lear Siegler. CALL!

ADM-31. The terminal that's too smart to be considered dumb.

ADM-42. Available with keyboard semiintelligent terminal offering tremendous user flexibility. The optional configurations are amazing.

Call for details.



#### HAZELTINE TERMINALS AT SPECTACULAR SAVINGS!

Hazeltine 1410. List \$850 CompuMart \$749 Hazeltine 1420. List \$995 CompuMart \$895 CompuMart \$995 Hazeltine 1500. List \$1095 Hazeltine 1510. List \$1395 CompuMart \$1325 Hazeltine 1520. List \$1585 CompuMart \$1485 Hazeltine 1552. List \$1395 CompuMart \$1295

Call CompuMart for complete specs and quantity discounts.

#### 

#### A CALCULATOR, A SYSTEM, A WHOLE NEW STANDARD.

#### **HEWLETT-PACKARD'S HP-41C**

HP-41C Calculator ......\$288.00 The System Memory Modules. For storing programs or up to

\$45.00 2,000 lines of program memory . . . . . . \$45.00 "Extra Smart" Card Reader. Records programs and data back onto blank mag-cards . . . \$199.00 The Printer. Upper and Lower case, High resolution plotting, Portable Thermal operation. Application Modules

Standard pac Statistics. Math, Financial & Surveying



The TI Programable Calculator — Super Sale \$229.00

#### **NOVATION CATTM** ACCOUSTIC MODEM

Answer Originate

• Bell 108

• 300 Baud Low Profile Design Looks good, works great! \$179.00

Texas Instruments TI-99/4 Home Computer Save \$300 on this 16-Bit computer with monitor

TI-99/4 w/Monitor TI-99/4 w/o Monitor \$889 \$725



#### apple computer

DOS 3.3 Convert disks to 16 sector format for 2.	
more storage and faster access	\$60
Apple Plot. The perfect graphic complement for calc.	r Visi- \$70
Dow Jones News & Quotes	\$95
Adventure	\$35
DOS Tool Kit	\$75
Apple Fortan	\$200

#### New From Videx! — Video Term.

80 column by 24 line 7 x 9 matrix — plug in compatible board for the Apple II. Price: \$325 w/o graphics EPROM

Options: Graphics EPROM	\$25
Video Switch Plate, inserts between Apple II	
Video and vidoterm board	\$12

#### NEW FROM MUSE FOR YOUR APPLE II

\$39.95
\$99.00
\$49.95
\$225
\$110
\$ 99

Apple II	• ••
New from Mountain Hardware — Expansion Accessories for Your Apple. Introl/X-10 System	\$289
Super Talker	\$299
The Music System	\$545
ROM plus board w/ Keyboard filter	\$199
New from Microsoft — The Z-80 Softcard	\$349
Apple III Accessories	

Silentype Thermal Printer . . . . . . . . . . . . . . . . . . \$525

Disk III																						
12" B&W Monitor																						
Vinyl Carry Case .																Į.						\$
We have a co						te	е	i	n	٧	16	9	n	t		o	7	/	(	0	f	
Apple compu	t	е	r	S	,								1	_	-	-	-	-	7	_	_	-

#### peripherals and software Introducing the HP-85 \$3,145

Hewlett-Packard's Personal Computer for Industry. This extremely portable computer features ex-

tended BASIC to solve your problems quickly and efficiently along with an advanced graphics system to enhance communication.

**NEW** from Hewlett-Packard HP 82900-Series Flexible Disk Drives for the

These 4 new Flexible Disk Drives provide fast on-line storage using flexible disks

\*HP 82901M. Supplies approx. 540K bytes of on-line \$2,500

\*HP 82902M. Approx. 270K bytes of on-line storage. \$1,500

\*HP 82901S. Supplies an additional 540K bytes when connected to an HP 82901M or an HP 82902M.

\*HP 829025, Supplies an additional 270K bytes when connected to an HP 82901M or an HP 82902M.

The Hewlett-Packard 7225A. High Quality/Low Cost

Call our expert sales force for complete product specifications

#### **BUY-OF-THE-MONTH** Apple III is Here



#### and We've Got It!

Apple III System Packages

Apple III Information Analyst Option A. Includes: Apple III System with 96K RAM memory. Information analyst configuration package, 12" B&W monitor for Apple III \$4,340

Apple III Information Analyst Option B. Same as Option A plus: Disk 11 for Apple III \$4,885

Apple III Information Analyst Option C. Same as Option A plus: Disk 11 for Apple III, Silentype Thermal Printer for Apple III \$5,410

Apple III Soft Visicalc III																			\$250
Mail List Mar	nage	r									Ĺ								\$250
<b>Business Bas</b>																			
PASCAL																			\$250
FORTRAN .																			\$250
System Softv	vare	8	k.	٨	12	ar	ı	lá	al	s									\$250

#### Super Sale on Exidy Sorcerer

	List Price	Sale!
16K Sorcerer	\$1,295	\$999
Parallel Data Cable	\$35	\$20
Development PAC	\$99	\$85
Word Processing PAC	\$199	\$169
S-100 Expansion Unit	\$419	\$389

Lots of other Sorcerer accessories in stock at low prices - CALL!

#### **ROCKWELL AIM 65**

The single board development system that's perfect in the classroom or lab.

Our AIM System includes: 4K AIM with BASIC interpretor assembler, Power Supply, Cassette recorder & Enclosure

4K AIM - 65 \$499 PL65 High Level Language \$125 Paper for the AIM (roll) Rockwell's 4-slot Motherboard (SALE)

\$799.

CompuMart's Microflex 65 System for your AIM Includes: Adapter Buffer Module w/ 4-slot module stack, 8K RAM module, 16K PROM/ROM module, Asynchronous communications Interface, & Power

Call or write for our complete Microflex 65 brochure



The All-In-One-Computer

This is the famous computer system which takes up no more space than a terminal alone. The 12" screen is beautiful and lends itself perfectly to professional applications thanks to its 25 lines of 80 characters. We know of no other computer which gives you this many features at such a low

	-
CompuMart	\$895
Z-19 Smart Video Terminal	List \$995
CompuMart	\$2,695
Zenith 48K Z-89 Dual Port	List \$2,895
price.	



COMMODORE

Buy Direct from the largest Commodore dealer in the country, and the very first Commodore distributor in the U.S. Buy from the experts- Buy from CompuMart.

Commodore—We have everything that Commodore manufactures. In stock for Immediate Delivery!

Call CompuMart now for low prices and special deals.

ATARI 800 Personal Computer System. Comes with 800 Operators Manual, 16K RAM Memory module, 10K ROM Operating System, power supply, TV Switch Box.

**PERIPHERALS** 

Atari 410 Program Recorder (FREE w/ purchase of Atari 800) \$89 95 Atari 810 Disk Drive \$699.95 New Dual Disk double density 825 Printer (Centronics 737) \$1499.95 \$995.00 RS232 Interface w/ Cable \$249.95 NEW! Light Pens Call for New Software





#### IMPORTANT ORDERING

INFORMATION All orders nuclude 4% shipping and

open from p.m. EST, Mon. Fri. • P.O.'s accepted from companiesshipment contingent upon receipt

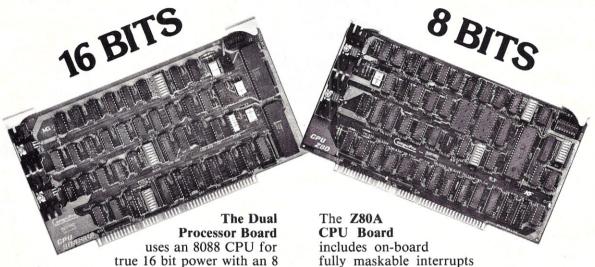
TO ORDER CALL: 800.343.E of signed purchase order . All prices are subject to change without notice . Most items in stock for immediate shipmentfor delivery quotation • In the Arin Arbor area? Our retail store is open 11:00 a.m. to 7:00 p.m. Tues, Fri., 5:00 p.m. Saturdays (closed Sun. and Mon.

270 THIRD STREET, DEPT 130 CAMBRIDGE, MA. 02142



## Throughput is the Only True Measure of Computer Performance.

Want a 300% improvement in throughput compared to 2 MHz systems? IEEE-compatible CompuPro boards are designed from the ground up to operate at 6 MHz and beyond, dramatically increasing computing power and performance. Don't settle for less . . . select high speed, high reliability S-100 products from CompuPro.



true 16 bit power with an 8 bit bus, and an 8085 for compatibility with CP/M and 8080 software.

SPECIAL LOW PRICES: \$295 unkit, \$425

SPECIAL LOW PRICES: \$295 unkit, \$425 assm (both operate at 5 MHz); \$525 qualified under the high - reliability Certified System Component program (with 5 MHz 8085, 6 MHz 8088).

fully maskable interrupts for interrupt- driven systems, provision for adding up to 8K of on-board EPROM, IEEE compatible 16/24 bit extended addressing, and much more. 4 MHz standard operation, but also works with 6 MHz Z80s. \$225 unkit, \$295 assm \$395 CSC.

#### HIGH SPEED S-100 MEMORY and MOTHERBOARDS

RAM XX (with bank select AND extended addressing) is the perfect match for either CPU board — thanks to fully static operation, extremely low power consumption, and complete IEEE spec compatibility. All unkit and assembled memories work up to 5 MHz, while Certified System Component boards run up to 8 MHz and are guaranteed to work with 6 MHz Z80s. All CompuPro motherboards work up to 10 MHz.

	unkit	assiii	CSC	
16K RAM XX-16	\$349	\$419	\$519	
24K RAM XX-24	\$479	\$539	\$649	
32K RAM XX-32	\$649	\$699	\$799	
20 slot motherboard with edge connectors	\$174	\$214	n/a	
12 slot motherboard with edge connectors				
6 slot motherboard with edge connectors	\$89	\$129	n/a	

SEE COMPUPRO PRODUCTS IN PERSON AT COMPUTER STORES WORLD-WIDE, OR WRITE US DIRECT IF THERE'S NO STORE IN YOUR AREA.

TERMS: Cal res add tax. Allow 5% for shipping, excess refunded. VISA®/Mastercard® orders call (415) 562-0636, 24 hours. Please include street address for UPS delivery. Sale prices good through cover month of magazine, other prices subject to change without notice.



from





P.O. Box 4430S Santa Clara, CA 95054 Will calls: 2322 Walsh Ave. (408) 988-1640

INTEGRATED CIRCUITS

Same day shipment. First line parts only. Factory tested. Guaranteed money back. Quality IC's and other components at factory prices.

7400TTL 7400N	19	LM323K-5 LM320K-12	5.95	CD4026 CD4027	2.50	4116 200ns 8/4116 200ns	7.95	CONNECTORS 30 pin edge	2.50	KEYBOARDS 56 key ASCII keyboard kit	\$67.50
7402N 7404N	20	LM320K-15	1.50	CD4028	85	2513B MM5262	6.30	44 pin edge	2.75	ully assembled 53 key ASCII keyboard kit	77.50 60.00
7409N 7410N	23	LM320T-8 LM320T-12	1.35	CD4030 CD4035	.45 1.35	MM5280 MM5320	3.00	100 pin edge WW	5.25	Fully assembled Enclosure Plastic	70.00
7414N 7420N	.70	LM320T-15 LM324N	1.35		1.35	MM5330 PD411D-3	5.94	IC SOCKETS Solder Tin Low P	rofile	Metal Enclosure	29.95
7422N	.39	LM339N	1.00	CD4043	.85	PD411D-4	5.00	PIN 1 UP PIN 8 .15 22	1UP	LEDS	
7430N 7442N	.20	LM340K-5 LM340K-8	1.35		1.67	P5101L 4200A	8.95 9.95	14 .14 24 16 .16 28	.35	Red T018 Green, Yellow T018	.15
7445N 7447N	.74	LM340K-12 LM340K-15	1.35	CD4049 CD4050 -	45	82S25 91L02A	2.90 1.50	18 .27 36	.58	Jumbo Red Green, Orange, Yellow Jumbo	.20
7448N 7450N	.77	LM340K-24 LM340T-5	1.35	CD4051 CD4060	1.13	HD0165-5 MM57100	6.95 4.50	20 .29 40 2 level 14 pin ww .2	.51	Cliplite LED Mounting Clips ( specify red, amber, green, yellow	3/\$1.25 v. clear)
7474N 7475N	.35	LM340T-8 LM340T-12	1.25	CD4066 CD4068	.71	GIAY38500-1 MCM66751A	9.95	WIRE WRAP LEV		CONTINENTAL SPECIALTIES II	stock
7485N 7489N 7490N	1.85 43	LM340T-15 LM340T-18 LM340T-24	1.25 1.25 1.25	CD 4069 CD 4070 CD 4071	.40 .50 .45	9368 410D 416	3.50 10.00 16.00	14 .32 24 16 .33 28 18 .57 40	.86 1.00 1.23	Complete line of breadboard test MAX-100 8 digit Freq. Ctr. \$	equip. 128.95
7492N 7493N	.43	LM350 LM377	7.50	CD4072 CD4073	.45		10.00	18 .57 40 CRYSTALS		OK WIRE WRAP TOOLS in stor	k \$18.00
7495N 7495N 74100N	1.20	LM379 LM380N	5.00	CD4075 CD4076	.45	CLOCKS MM5311	5.50	1 MHz 2 MHz	4.50	Complete line of AP Products in	
74107N	.35	LM381	1.60	CD4078	.40	MM5312 MM5314	3.90	4 MHz	4.50 4.25 4.25	SPECIAL PRODUCTS	
74121N 74123N	.34	LM382 LM703H	1.60	CD4081 CD4082	35	MM5369 MM5841	2.10	5 MHz 10 MHz 18 MHz	4.25 3.90	MM5865 Stopwatch Timer with 10 pg. spec.	9.00
74125N 74145N	.45 .77	LM709H . LM723H/N	.50	CD4116 CD4490	5.50	MM5865 CT7010	7.95 8.95	20 MHz	3.90	PC board Switches Mem. Pushbutton	7.50
74150N 74151N	1.20	LM733N LM741CH	.85		1.00	CT7015 MM5375AA/I	8.95	32 MHz 32768 Hz	3.90 4.00	3 pos. slide Encoder HD0165 5	6.95
74154N 74157N	2.00	LM741N LM747H/N	.38	CD4510 CD4511	1.02	MM5375AG/ 7205	16.50	1.8432 MHz 3.5795 MHz	4.50	Paratronics 100A Logic	425.00
74161N 74162N	1.25	LM748N LM1303N	1.75	CD4515 CD4516	2.52	7207 7208	7.50 15.95	2.0100 MHz 2.097152 MHz	1.95 4.50	Model 10 Trigger	229.00
74163N 74174N	.87	LM1304 LM1305	1.10	CD4518 CD4520	1.02	7209 DS0026CN	4.95	2.4576 MHz 3.2768 MHz	4.50 4.50	Model 150 Bus	369.00
74175N 74190N	1.15	LM1307 LM1310	2.00	CD4527 CD4528	1.51	DS0056CN MM53104	3.75 3.75 2.50	5.0688 MHz 5.185 MHz	4.50 4.50		\$23.95
74192N 74193N	.87	LM1458 LM1812	7.50	CD4553 CD4566	3.50	MICROPROC	-	5.7143 MHz 6.5536 MHz	4.50 4.50	2.5 MHz Frequency	\$37.50
74221N 74298N	2.75	LM1889 LM2111	3.00	CD4583 CD4585	2.35	6502 6504	10.95	14.31818 MHz 18.432 MHz	4.25	30 MHz Frequency	\$47.75
74365N 74366N	.89	LM2902 LM3900N	2.25	CD40192 74C00	3.00	6522 6800	9.95	22.1184 MHz	4.50	TRANSFORMERS	**1.10
74367N	.89	LM3905 LM3909N	1.75	74C04 74C10	.40	6802 6820	11.95	KEYBOARD ENCO AY5-2376	\$12.50	6V 300 ma 12 Volt 300 ma transforme	3.25 r 1.25
74LS00 TTL 74LS00N	.35	MC1458V NE550N	1.00	74C14 74C20	1.95	6850 8080A	5.95	AY5-3600 AY5-9100	17.95 10.50	12.6V CT 600 ma	3.75
74LS00N 74LS02N 74LS04N	.35	NE555V NE556A	.39	74C30	.35	8085 8086	12.95 75.00	AY5-9200 74C922	16.50 5.50	12V 250 ma wall plug 12V CT 250 ma wall plug	3.50
74LS05N 74LS05N	.40	NE565A NE566V	1.00	74C74 74C74	2.25 85 1.75	Z80 Z80A	9.95	74C923 HD0165-5	5.50 6.95	24V CT 400 ma 10V 1.2 amp wall plug	3.95 4.85 12.95
74LS10N 74LS10N 74LS13N	.45 .45	NE567V NE570B	1.00		1.75	8212 - 8214	2.90	AY5-9400	10.50	12V 6 amp 12V 500 ma wall plug	4.75
74LS13N 74LS14N 74LS20N	1.25	78L05 78L08	60	74C154	3.00	8216 8224	2.90	D Connectors RS: DB25P	3.62	12V 1 amp wall plug 10/15 VAC 8/16 VA wall plu	6.50 ig 9.75
74LS22N	45	78M05	.85	74C175 74C192	1.35	8228 8251	4.95 6.95	DB25S Cover	5.20 1.67	DISPLAY LEDS	
74LS28N 74LS30N 74LS33N	.45 .75	75108 75491CN 75492CN	1.75 .50 .55	74C221	2 25 2 50 6 00	8253 8255	15.00	DE9S DA15P	1.95	MAN1 CA .27 MAN3 CC .12	0 2.90 5 .39
74LS38N	.75	75492CN 75494CN	.89	74C906	.75	8257 8259	10.95	DA15S Complete Set	3.10 9.50	MAN72/74 CA/CA 30	0 1 00
74LS74N 74LS75N	1.25			74C914 74C922	1.95	1802CP plas 1802DP plas	13.95	Hickok 3½ Digit L	FD mul-	DL704 CC .30 DL707/DL707R CA .30	0 1.00
74LS90N 74LS93N	1.00	A to D CON 8038B	4.50	740925	6.00 7.50	1861P CDP1802CD	11.50 28.95	timeter Stopwatch Kit	74.95 26.95	DL727/728 CA/CC .50 DL747/750 CA/CC .60	0 1.95
74LS95N 74LS107N	1.10	8700CJ 8701CN	13.95	74C926 74C927	6.95 6.95	CDP1802CD CDP1802D CDP1861	35.00 15.95	Auto Clock Kit Digital Clock Kit	17.95	DL750 CC .60 FND359 CC .35	7 .70
74LS112N 74LS113N	.65	8750CJ LD130	13.95 9.95	INTERFACE	12.0	UART/FIFO	13.33	8K/16K Eprom Kit	.,	FND500/507 CC/CA .50 FND503/510 CC/CA .50	0 .90
74LS132N 74LS136N	.65	9400CJV/F ICL7103	7.40 9.50	8095 8096	65	AY5-1013 AY5-1014	5.50 7.50	(less PROMS)	\$89.00	FND800/807 CC/CA .80 3 digit Bubble	.60
74LS151N 74LS155N	1.10	ICL7107	14.25	8097 8098	.65	3341	6.95	Extender Board	\$15.00	4 digit Bubble DG8 Fluorescent	1.75
74LS157N 74LS162N	1.10	CMOS CD4000	.25	8T10	1.25	PROM		RESISTORS 14	watt 5%	DG10 Fluorescent 10 digit display	1.75
74LS163N 74LS174N	1.65	CD4001 CD4002	.35	8T20	3.00 5.50	1702A 2513B upper	4.95 case 8.7	10 per type .0. 25 per type .0.	25	7520 Clairex photocells TIL311 Hex	9.50
74LS190N 74LS221N	1.25	CD4006 CD4007	1.10	8T24	3.10	2708 2716T1	7.75 18.00	100 per type .0 1000 per type .1	012	MAN3640 CC .30 MAN4610 CA .40	1.10
74LS258N 74LS367N	1.60	CD4008 CD4009	.28	8T26	3.20 1.69		23.00 160.00	350 piece pack 5 per type 6	.75	MAN4610 CA .40 MAN4640 CC .40 MAN4710 CA .40 MAN4740 CC .40 MAN6640 CC .56	.95
LINEAR		CD4010 CD4011	.45		2.75 1.69	2732 2758	65.00 22.50	1/2 watt 5% per	type .05	MAN4740 CC .40 MAN6640 CC .56	1.20 2.95 1.35
CA3045 CA3046	1.10	CD4012 CD4013	.28	8T98	1.69	8741A 8748	60.00	Televideo Termin		MAN6710 CA .60 MAN6740 CC .60	1.35
CA3081 CA3082	1.80	CD4014 CD4015	1.25	MOS/MEMOR		8748-8 8755A	60.00 55.00		8845.00 8945.00	MA1002A	8.95
CA3089 LM301AN/AH	2.95	CD4016 CD4017	1.05	2101-1 2102-1	2.95	N82S23 N82S123	2.95 6.50	Timy Basic Experime	enters Kil	MA1002E	8.95
LM305H LM307N	.87	CD4018 CD4019	.94	2102AL-4 2102AN-2L	1.34	N82S126 N82S129	3.75	.my vesic expension	\$10.00	MA1012A 102P3 transformer	8.95 2.25
LM308N LM309K	1.00	CD4020 - CD4021	1.02	2104A-4 2107B-4	4.95	N82S131 N82S136	8.50 8.75	BSR Controller	\$39.95	MA1012A Transformer	2.25
LM311H/N LM317T/K	.90	CD4022 CD4023	1.10	2111-1 2112-2	3.75	N82S137 DM8577	8.75	Connect your computer of System Computer of	er to the BSR I	forme Control	
LM318 LM320K-5	1.35	CD4024 CD4025	.28 .75 .28	2114L 300ns 2114L 450ns	6.75	8223	2.90	mitter for your BSR.	Software for	1802 user.	

#### PROM Eraser

assembled, 25 PROM capacity \$37.50 (with timer \$69.50). 6 PROM capacity OSHA/ UL version \$69.50 (with timer \$94.50).

Z80 Microcomputer
16 bit I/O, 2 MHz clock, 2K RAM, ROM Bread-board space. Excellent for control. Bare Board \$28.50, Full kit \$99.00. Monitor \$20.00. Power Supply Kit \$35.00. Tiny Basic \$30.00

S-100 Computer Boards

8K Static Godbout Econo IIA Kit 16K Static Godbout Econo XIV Kit 145 00 24K Static Godbout Econo VIIA-24 Kit 435.00 32K Static Godbout Econo X-32 Kit 16K Dynamic RAM Kit 32K Dynamic RAM Kit 64K Dynamic RAM Kit 575.00 199.00 310.00 Video Interface Kit \$135.00

80 IC Update Master Manual \$55.00 Comp. IC data selector, 2700 pg. master reference guide. Over 51,000 cross references. Free update service through 1980. Domestic postage \$3.50.

Modem Kit \$60.00

State of the art, orig., answer. No tuning necessary. 103 compatible 300 baud. Inexpensive acoustic coupler plans included.

LRC 7000 + Printer \$389.00

40/20 column dot matrix impact, std. paper. Interface all personal computers.

64/40/32/20 version \$405.00. Optional cables

available.

LRC 7000 printer interface cable for Super Elf \$26.00

NiCad Battery Fixer/Charger Kit

Opens shorted cells that won't hold a charge and then charges them up, all in one kit w/full parts and instructions. \$7.25

Rockwell AIM 65 Computer

6502 based single board with full ASCII keyboard and 20 column thermal printer. 20 char, alphanumeric display, ROM monitor, fully expandable. \$375.00. 4K version \$450.00. 4K Assembler \$85.00. 8K Basic Interpreter \$100.00

Special small power supply for AIM65 assem. in frame \$54.00. Complete AIM65 in thin briefcase with power supply \$499.00. Molded plastic enclosure to fit both AIM65 and power supply \$47.50. Special Package Price: 4K AIM, 8K Basic, ower supply, cabinet \$599.00
AIM65/KIM/VIM/Super Elf 44 pin expansion

board; 3 female and 1 male bus. Board plus 3

60 Hz Crystal Time Base Kit \$4.40 Converts digital clocks from AC line frequency to crystal time base. Outstanding accuracy.

Video Modulator Kit Convert TV set into a high quality monitor w/o affecting usage. Comp. kit w/full instruc.

Multi-volt Computer Power Supply 8v 5 amp,  $\pm$ 18v .5 amp, 5v 1.5 amp, -5v .5 amp,  $\pm$ 12v .5 amp, -12v option.  $\pm$ 5v,  $\pm$ 12v are regulated. Basic Kit \$29.95. Kit with chassis and all hardware \$43.95. Add \$4.00 shipping. Kit of hardware \$14.00. Woodgrain case \$10.00. \$1.50 shipping.



#### RCA Cosmac 1802 Super Elf Computer \$106.95 plus load, reset, run, wait, input, memory pro-tect, monitor select and single step. Large, on

Compare features before you decide to buy any other computer. There is no other computer on the market today that has all the desirable bene fits of the Super Elf for so little money. The Super Elf for so little money. The Super Elf for so little money. The Super Elf is a small single board computer that does many big things. It is an excellent computer for raining and for learning programming with its machine language and yet it is easily expanded with additional memory, Full Basic. ASCII Keyboards, video character generation, etc.

Before you buy another small computer, see if it includes the following features: ROM monitor; State and Mode displays; Single step; Optional address displays; Power Supply; Audio Amplifier and Speaker; Fully socketed for all IC's; Real cost of in warranty repairs: Bull documentation. of in warranty repairs: Full documentation.

The Super Elf includes a ROM monitor for program loading, editing and execution with SINGLE STEP for program debugging which is not included in others at the same price. With SINGLE STEP you can see the microprocessor chip operating with the unique Quest address and data bus displays before, during and after executing in-structions. Also, CPU mode and instruction cycle are decoded and displayed on 8 LED indicators

An RCA 1861 video graphics chip allows you to connect to your own TV with an inexpensive video modulator to do graphics and games. There is a speaker system included for writing your own music or using many music programs already written. The speaker amplifier may also be used to drive relays for control purposes.

A 24 key HEX keyboard includes 16 HEX keys

Inis is truly an astounoing value! This board has been designed to allow you to decide how you want it optioned. The Super Expansion Board comes with 4K of low power RAM fully addressable anywhere in 64K with built-in memory protect and a cassette interface. Provisions have

been made for all other options on the same board and it fits neatly into the hardwood cabinet alongside the **Super Elf**. The board includes slots for up to 6K of **EPROM** (2708, 2758, 2716 or TI 2716) and is **fully socketed**. EPROM can be used

for the monitor and Tiny Basic or other purposes.

A IK Super ROM Monitor \$19.95 is available as an on board option in 2708 EPROM which has

been preprogrammed with a program loader/ editor and error checking multi file cassette

read/write software, (relocatable cassette file) another exclusive from Quest. It includes register

save and readout, block move capability and

video graphics driver with blinking cursor. Break

Super Expansion Board with Cassette Interface \$89.95 This is truly an astounding value! This board has

\$3.00, Chip 8 Interpreter \$5.50.

sues 1-12 bound \$16.50.

to isolate program bugs quickly, then follow with single step. If you have the **Super Expansion Board** and **Super Monitor** the monitor is up and running at the push of a button.

teletype or other device are on board and if you need more memory there are two \$-100 slots for static RAM or video boards. Also a 1K Super Monitor version 2 with video driver for full capability display with Tiny Basic and a video interface board. Parallel I/O Ports \$9.85, R\$ 232 \$4.50, TTY 20 ma I/F \$1.95, S-100 \$4.50. A 50 pin connector set with ribbon cable is available at \$15.25 for easy connection between the Super Elf and the Super Expansion Board.

Power Supply Kit for the complete system (see Multi-volt Power Supply). - SECOND GENERATION

Announcing Quest Super Basic-Enhancements include increased speed, built-in provisions for Stringy Floppy, Floppy Disc, Printer Driver, I/O, user definable command library and statement renumbering. A new enhanced version of Super Basic now

A flew enflations version to super basic flow available. Quest was the first company worldwide to ship a full size Basic for 1802 Systems. A concluding floating point capability with scientific notation (number range ± 17E<sup>20</sup>), 32 b1t integer ±2 billion; multi dim arrays, string arrays; string manipulation; cassette I/O; save and load, basic, data and machine language programs; and over 75 statements, functions and operations.

Gremlin Color Video Kit \$69.95 32 x 16 alpha/numerics and graphics; up to 8 colors with 6847 chip; 1K RAM at E000. Plugs into Super Elf 44 pin bus. No high res. graphics. On board RF Modulator Kit **\$4.95** 

1802 16K Dynamic RAM Kit \$149.00 Expandable to 32K. Hidden refresh w/clocks up to MHz w/no wait states. Addl. 16K RAM \$63.00 Super Elf 44 pin expansion board; 3 female and 1

male bus. Board plus 3 connectors \$22.95 Tiny Basic Extended on Cassette \$15.00 (added commands include Stringy, Array, Cassette I/O etc.)

S-100 4-Slot Expansion \$ 9.95 Super Monitor VI.I Source Listing \$15.00 points can be used with the register save feature

board displays provide output and optional high and low address. There is a 44 pin standard

connector slot for PC cards and a 50 pin connector slot for the Quest Super Expansion Board. Power supply and sockets for all IC's are included in the price plus a detailed 127 pg. instruc-tion manual which now includes over 40 pgs. of

software info. including a series of lessons to

help get you started and a music program and graphics target game. Many schools and universities are using the Super Elf as a course of study OEM's use it for training and R&D. Remember, other computers only offer Super Elf

features at additional cost or not at all. Compare before you buy. Super Elf Kit \$106.95, High address option \$8.95, Low address option \$9.95. Custom Cabinet with drilled and labelled plexiglass front panel \$24.95. All metal Expan-

sion Cabinet, painted and silk screened, with room for 5 S-100 boards and power supply \$57.00. NiCad Battery Memory Saver Kit \$6.95.

All kits and options also completely assembled

Questdata, a software publication for 1802 com-

puter users is available by subscription for \$12.00 per 12 issues. Single issues \$1.50. Is-

Tiny Basic Cassette \$10.00, on ROM \$38.00 original Elf kit board \$14.95. 1802 software; Moews Video Graphics \$3.50. Games and Music

Other on board options include Parallel Input and Output Ports with full handshake. They allow easy connection of an ASCII keyboard to the input port. RS 232 and 20 ma Current Loop for

Easily adaptable to most 1802 systems. Requires 16K RAM minimum for Basic and user

programs. Source listing for both Serial and Parallel I/O included.

Super Basic on Cassette \$40.00

Elf II Adapter Kit \$24.95

Plugs into Elf II providing Super Elf 44 and 50 pin plus S-100 bus expansion. (With Super Expansion). High and low address displays, state and mode LED's optional \$18.00.

Super Color S-100 Video Kit \$129.95 Expandable to 256 x 192 high resolution color graphics. 6847 with all display modes computer controlled. Memory mapped. 1K RAM expandable to 6K. S-100 bus 1802, 8080, 8085, Z80 etc.

**Editor Assembler** (Requires minimum of 4K for E/A plus user

1802 Tiny Basic Source listing Super Monitor V2.0/2.1 Source Listing \$20.00

\$5.00 min. order U.S. Funds. Califresidents add 6% tax. \$10.00 min. order BankAmericard and Master Charge and COD. \$1.00 insurance optional. Shipping charges will be added on charge cards.

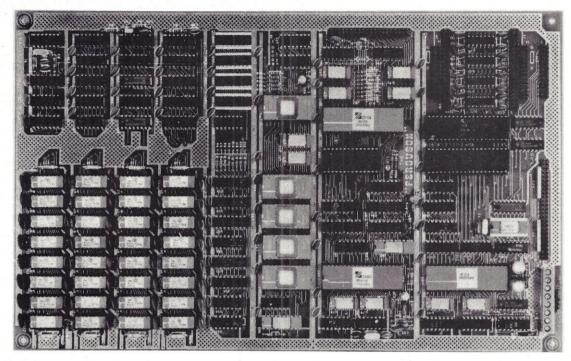
FREE: Send for your copy of our NEW 1980 QUEST CATALOG. Include 48¢ stamp.

## NEW!

### "THE BIG BOARD" OEM - INDUSTRIAL - BUSINESS - SCIENTIFIC

### SINGLE BOARD COMPUTER KIT! Z-80 CPU! 64K RAM!





FEATURES: (Remember, all this on one board!)

THE FERGUSON PROJECT: Three years in the works, and maybe too good to be true. A tribute to hard headed, no compromise, high performance, American engineering! The Big Board gives you all the most needed computing features on one board at a very reasonable cost. The Big Board was designed from scratch to run the latest version of CP/M\*. Just imagine all the off-the-shelf software that can be run on the Big Board without any modifications needed! Take a Big Board, add a couple of 8 inch disc drives, power supply, and an enclosure; and you have a total Business System for about 1/3 the cost you might expect to pay.

REQU

(64K KIT BASIC I/0)

SIZE: 8½ x 13¾ IN. SAME AS AN 8 IN. DRIVE. REQUIRES: +5V @ 3 AMPS + - 12V @ .5 AMPS.

\$649<sup>00</sup>

#### 64K RAM

Uses industry standard 4116 RAM'S. All 64K is available to the user, our VIDEO and EPROM sections do not make holes in system RAM. Also, very special care was taken in the RAM array PC layout to eliminate potential noise and glitches.

#### 7-80 CPU

Running at 2.5 MHZ. Handles all 4116 RAM refresh and supports Mode 2 INTERUPTS. Fully buffered and runs 8080 software.

#### SERIAL I/O (OPTIONAL)

Full 2 channels using the Z80 SIO and the SMC 8116 Baud Rate Generator. FULL RS232! For synchronous or asynchronous communication. In synchronous mode, the clocks can be transmitted or received by a modem. Both channels can be set up for either data-communication or data-terminals. Supports mode 2 Int. Price for all parts and connectors: \$85.

#### BASIC I/O

Consists of a separate parallel port (Z80 PIO) for use with an ASCII encoded keyboard for input. Output would be on the 80 x 24 Video Display.

#### 80 x 24 CHARACTER VIDEO

With a crisp, flicker-free display that looks extremely sharp even on small monitors. Hardware scroll and full cursor control. Composite video or split video and sync. Character set is supplied on a 2716 style ROM, making customized fonts easy. Sync pulses can be any desired length or polarity. Video may be inverted or true.

#### FLOPPY DISC CONTROLLER

Uses WD1771 controller chip with a TTL Data Separator for enhanced reliability. IBM 3740 compatible. Supports up to four 8 inch disc drives. Directly compatible with standard Shugart drives such as the SA800 or SA801. Drives can be configured for remote AC off-on. Runs CP/M\* 2.2.

#### FOUR PORT PARALLEL I/O (OPTIONAL)

Uses Z-80 PIO. Full 16 bits, fully buffered, bi-directional. User selectable hand shake polarity. Set of all parts and connectors for parallel I/O: \$29.95

#### REAL TIME CLOCK (OPTIONAL)

Uses Z-80 CTC. Can be configured as a Counter on Real Time Clock. Set of all parts: \$14.95

## SYSTEM COMPARISON 64K RAM KIT \$370.00 80 x 24 Video Kit 365.00 Floppy Disk Controller Kit 235.00 7-80 CPU Kit 185.95 SER & PAR. I/O 129.95 S-100 Mother Board 45.00 SUB TOTAL \$1330.90

Talk about bangs per buck! The prices shown for S100 kits were taken from the July 1980 BYTE. This will give some basis for comparison between the Big Board and a similar system implementation on the S100 Buss.

#### CP/M\* 2.2 FOR BIG BOARD

The popular CP/M\* D.O.S. modified by MICRONIX SYSTEMS to run on Big Board is available for \$150.00.

#### FIRST TIME OFFERED!

#### PFM 3.0 2K SYSTEM MONITOR

The real power of the Big Board lies in its PFM 3.0 on board monitor. PFM commands include: Dump Memory, Boot CP/M\*. Copy, Examine, Fill Memory, Test Memory, Go To, Read and Write I/O Ports, Disc Read (Drive, Track, Sector), and Search. PFM occupies one of the four 2716 EPROM locations provided. It does not occupy any of the 64K of system RAM!

### Digital Research Computers

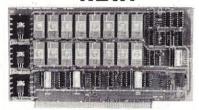
P.O. BOX 401565 • GARLAND, TEXAS 75040 • (214) 271-3538

**TERMS:** Initial shipments will be made approximately 3 to 5 weeks after we receive your order. VISA, MC, cash accepted. We will accept COD's (for the Big Board only) with a \$75 deposit. Balance UPS COD. The \$75 deposit assures your place in line for the initial production run of Big Board.

### **DIGITAL RESEARCH COMPUTERS**

(214) 271-3538

### 32K S-100 EPROM CARD



**USES 2716's** 

Blank PC Board - \$34 **ASSEMBLED & TESTED ADD \$30** 

SPECIAL: 2716 EPROM's (450 NS) Are \$19.95 EA. With Above Kit.

- 1. Uses +5V only 2716 (2Kx8) EPROM's.
- 2. Allows up to 32K of software on line!
- 3. IEEE S-100 Compatible
- Addressable as two independent 16K 9. Gold plated contact fingers
- 5. Cromemco extended or Northstar bank
- 6. On board wait state circuitry if needed. 12. Easy and quick to assemble.
- 7. Any or all EPROM locations can be disabled.
- 8. Double sided PC board, solder-masked silk-screened.
- 10. Unselected EPROM's automatically
- powered down for low power. 11. Fully buffered and bypassed.

#### LOOK! INTEL 2108 8K X 1 RAMS **16K DYNAMIC RAM PARTIALS** LOOK! **FACTORY PRIME!**

Huge special purchase of INTEL Dynamic RAM's. These are 2108-4, 300NS, 8K, Ceramic DIP. The 2108 is the INTEL 2116 (16K) tested for either upper or lower 8K only. These are factory prime. Full Spec. See INTEL 1978 Cat. for details or Memory Design Handbook for application data. Both IMSAI and EXTENSYS did mfg. S-100 RAM boards using these devices. - P.S. These devices will not work in the SD EPANDORAM™. Please specify upper or lower 8K. (S1626 or S1627). A super easy RAM to interface to a Z80, 16 PIN DIP.

SALE! FOR 4MHZ

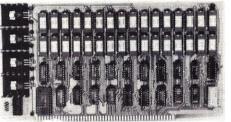
**LOW POWER - 300NS 2114 RAM SALE!**  8 FOR \$44

4K STATIC RAM'S. MAJOR BRAND, NEW PARTS. These are the most sought after 2114's, LOW POWER and 300NS FAST. 8 FOR \$44

#### 16K STATIC RAM KIT-S 100 BUSS



FOR 4MH7 **ADD \$10** 



KIT FEATURES:

- Addressable as four separate 4K Blocks.
  ON BOARD BANK SELECT circuitry. (Cro-
- memco Standard). Allows up to 512K on line!
  3. Uses 2114 (450NS) 4K Static Rams.
  4. ON BOARD SELECTABLE WAIT STATES.
- Double sided PC Board, with solder mask and silk screened layout. Gold plated contact fingers.
- 6. All address and data lines fully buffered
- Kit includes ALL parts and sockets PHANTOM is jumpered to PIN 67
- LOW POWER: under 1.5 amps TYPICAL from the +8 Volt Buss
- 10. Blank PC Board can be populated as any

BLANK PC BOARD W/DATA-\$33 LOW PROFILE SOCKET SET-\$12

SUPPORT IC'S & CAPS-\$19.95

ASSEMBLED & TESTED-ADD \$35

COMPLETE KIT!

**\$84**95

(WITH DATA MANUAL)

**BLANK PC** 

**BOARD W/DATA** 

\$31

**OUR #1 SELLING** RAM BOARD!

#### 16K STATIC RAM SS-50 BUSS

PRICE CUT!

**FULLY STATIC!** 

FOR 2MHZ **ADD \$10** 

FOR SWTPC 6800 BUSS!

ASSEMBLED AND TESTED - \$35

KIT FEATURES:

- Addressable on 16K Boundaries
- Uses 2114 Static Ram
- Fully Bypassed
  Double sided PC Board. Solder mask
- and silk screened layout. All Parts and Sockets included
- 6. Low Power: Under 1.5 Amps Typical

BLANK PC BOARD-\$30 COMPLETE SOCKET SET-\$12 SUPPORT IC'S AND CAPS-\$19.95

#### STEREO! NEWI NEW! S-100 SOUND COMPUTER BOARD

At last, an S-100 Board that unleashes the full power of two unbelievable General Instruments AY3-8910 NMOS computer unbellevable General Instruments A Y3-8910 NMOs computer sound ICs. Allows you under total computer control to generate an infinite number of special sound effects for games or any other program. Sounds can be called in BASIC, ASSEMBLY LANGUAGE, etc.

KIT FEATURES:

TWO GL SOUND COMPLITER IC'S

FOUR PARALLEL I/O PORTS ON BOARD.
USES ON BOARD AUDIO AMPS OR YOUR STEREO.
ON BOARD PROTO TYPING AREA.
ALL SOCKETS, PARTS AND HARDWARE ARE INCLUDED.

PC BOARD IS SOLDERMASKED, SILK SCREENED, WITH GOLD CONTACTS.
EASY, QUICK, AND FUN TO BUILD. WITH FULL INSTRUCTIONS.
USES PROGRAMMED I/O FOR MAXIMUM SYSTEM FLEXIBILITY. Both Basic and Assembly Language Programming examples are included.

#### SOFTWARE:

SCL" is now available! Our Sound Command Language makes writing Sound Effects programs a SNAP! SCL" also includes routines for Register-Examine-Modify, Memory-Examine-Modify, and Play-Memory. SCL" is available on CP/M' compatible diskette of 2708 or 2716. Diskette \$24.95 2708 - \$19.95 2716 - \$29.95 Diskette includes the source. EPROM'S are ORG at

#### RCA CMOS COMPUTER CHIP SET

INCLUDES:

1-CDP1802CD CPU 2-CDP1822CE 256 x 4 RAM 1-CDP1858CE 4 BIT LATCH

1-CDP1861CD VIDEO IC 1-CDP1862CE COLOR GEN. 1-CDP1863CE SOUND GEN.

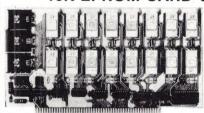
COMPLETE SET \$45

LIMITED QTY

### Digital Research Computers

P.O. BOX 401565 • GARLAND, TEXAS 75040 • (214) 271-3538

#### 16K EPROM CARD-S 100 BUSS



KIT

**BLANK PC BOARD - \$28** 

USES 2708's!

Thousands of personal and business systems around the world use this board with complete satisfaction. Puts 16K of software on line at ALL TIMES! Kit features a top quality soldermasked and silk-screened PC board and first run parts and sockets. Any number of EPROM locations may be disabled to avoid any memory conflicts. Fully buffered and has WAIT STATE capabilities.

ASSEMBLED AND FULLY TESTED - ADD \$30

OUR 450 NS 2708'S ARE \$8.95 EA. WITH PURCHASE OF KIT

#### **NEW!** G.I. COMPUTER SOUND CHIP

AY3-8910. As featured in July, 1979 BYTE! A fantastically powerful Sound & Music Generator. Perfect for use with any 8 Bit Microprocessor. Contains: 3 Tone Channels, Noise Generator, 3 Channels of Amplitude Control. 16 bit Envelope Period Control, 2-8 Bit Parallel I/O. 3 D to A Converters, plus much more! All in one 40 Pin DIP. Super easy interface to the S-100 or other busses

Add \$3 for 60 page Data Manual SPECIAL OFFER: \$14.95 each

TERMS: Add \$1.25 postage. We pay balance. Orders under \$15 add 75¢ handling. No. C.O.D. We accept Visa and MasterCharge. Tex. Res. add 5% Tax. Foreign orders (except Canada) add 20% P & H. 90 Day Money Back Guarantee on all items. Orders over \$50, add 85¢ for insurance.

#### **BLAK-RAY Ultraviolet Intensity Meter**

TWO MODELS: LONG WAVE AND SHORT WAVE



Meter consists of a sensor cell attached to a compact (3"  $\times$  3%"  $\times$  3") metering unit. Can be hand-held or placed directly on surface for measuring. Can be used remotely, while connected to a meter housing by a 4-foot extension cord. Two models available - one for long wave and one for short wave ultraviolet. Readings are in microwatts per square centimeter. Weight: 1 lb.

Completely assembled (includes sensor cell, reduction screen, excension cord, contrast filter and certification report.)

J-221 LONG WAVE (300nm-400nm) . . . . . . \$242.00

J-225 SHORT WAVE \$260.00 (200nm-280nm) . . . . . . . . .

#### **EPROM Erasing Lamp**



- Erases 2708, 2716, 1702A, 5203Q, 5204Q, etc.
- Erases up to 4 chips within 20 minutes
   Maintains constant exposure distance of one inch
- Special conductive foam liner eliminates static
- Built-in safety lock to prevent UV exposure

UVS-11E . . . . . . . . . . \$79.50

• Compact — only 7-5/8" x 2-7/8" x Complete with holding tray for 4 chips

#### Jumbo 6-Digit Clock Kit

- \* Four .630"ht. and two .300"ht.
- \* Uses MM5314 clock chip
- \* Uses MM3314 clock chip \* Switches for hours, minutes and hold functions \* Hours easily viewable to 30 feet \* Simulated walnut case \* 115 VAC operation \* 12 or 24 hour operation

- \* Includes all compor \* Size: 64 x 34 x 14 onents, case and wall transformer

JE747.....\$29.95



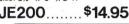
- Bright .300 ht. comm. cat ode display

  Uses MM5314 clock chip
- Uses MM5314 clock chip Switches for hours, minutes and hold modes Hrs. easily viewable to 20 ft.
   Simulated walnut case 1115 VAC operation 12 or 24 hr. operation Incl. all components, case & wall transformer.
   Sizes 6% × 3-1/8" × 1%"
- **JE701**

#### 6-Digit Clock Kit \$19.95

#### Regulated Power Supply

Uses LM309K. Heat sink provided. PC board construction. Provides a solid 1 amp @ 5 volts. Can supply up to ±5V, ±9V and ±12V with JE205 Adapter. Includes components, hardware and instructions. Size: 3½" x 5" x 2"H





ADAPTER BOARD -Adapts to JE200- $\pm 5V$ ,  $\pm 9V$  and  $\pm 12V$ 

DC/DC converter with +5V input. Toriodal hispeed switching XMFR. Short circuit protection. PC board construction. Piggy-back to JE 200 board. Size: 3%" x 2" x 9/16" H

JE205 .....\$12.95

#### MICROPROCESSOR COMPONENTS

	-8080A/8080A SUPPORT DEVICES		JII 00.			
8080A	CPU	\$ 7.95			DCESSOR MANUALS	
8212	8-Bit Input/Output	3.25	M-Z80	User Manu		\$7.50
8214	Priority Interrupt Control	5.95	M-CDP1802	User Manu		7.50
8216	Bi-Directional Bus Driver	3.49	M-2650	User Manu	al	5.00
8224	Clock Generator/Driver	3.95				
8226	Bus Driver	3.49				
		4.95	-	A	ROM'S -	
8228	System Controller/Bus Driver		2513(2140)		enerator(upper case)	\$9.95
8238	System Controller	5.95	2513(3021)	Character G	enerator(lower case)	9.95
8251	Prog. Comm. 1/0 (USART)	7.95	2516	Character 6	enerator	10.95
8253	Prog. Interval Timer	14.95	MM5230N	2048-Bit Be	ead Only Memory	1.95
8255	Prog. Periph. 1/0 (PPI)	9.95	Miliozoon		,,	
8257	Prog. DMA Control	19.95				
8259	Prog. Interrupt Control	14.95			- RAM'S	
	-6800/6800 SUPPORT DEVICES		1101	neevs	Static	\$1.49
MC6800	MPII	\$14.95	1101	256X1		
MC6802CP	MPU with Clock and Ram	19.95	1103	1024X1	Dynamic	.99
MC6810API	128X8 Static Ram	4.95	2101(8101)	256X4	Static	3.95
MC6821	Periph. Inter. Adapt (MC6820)	7.49	2102	1024X1	Static	1.75
MC6828	Priority Interrupt Controller	10.95	21L02	1024X1	Static	1.98
MC6830L8	1024X8 Bit ROM (MC68A30-8)	14.95	2111(8111)	256X4	Static	3.9
MC6850		6.95	2112	256X4	Static MOS	4.9
	Asynchronous Comm. Adapter		2114	1024X4	Static 450ns	5.95
MC6852	Synchronous Serial Data Adapt.	6.95	2114L	1024X4	Static 450ns low power	6.95
MC6860	0-600 bps Digital MODEM	10.95	2114-3	1024X4	Static 300ns	7.49
MC6862	2400 bps Modulator	12.95	2114L-3	1024X4	Static 300ns low power	7.96
MC6880A	Quad 3-State Bus. Trans. (MC8T26)	2.25	5101	256X4	Static	7.95
MICR	OPROCESSOR CHIPS—MISCELLANEO	US	5280/2107	4096X1	Dynamic	4.95
Z80(780C)	CPU	\$13.95	7489	16X4	Static	1.75
Z80A(780-1)	CPU	15.95	UPD414	4K	Dynamic 16 pin	4.95
CDP1802	CPU	19.95	(MK4027)	411	bynamic to pin	1,00
2650	MPU	16.95	MM5290-2	16K	Dynamic 16 pin 150NS	6.99
6502	CPU	11.95	IVIIVIDE DO E	101	(UPD416/MK4116)	0.5
8035N6	8-Bit MPU w/clock, RAM, 1/0 lines	19.95	TMS4044-	4K	Static	14.95
P8085	CPU	19.95	45NL	40	Static	14.90
TMS9900JL	16-Bit MPU	13.33	TMS4045	1024X4	Static	14.98
I M 999001	10-BIL MPU	40.05				
		49.95	2117	16,384X1	Dynamic 350ns	9.95
	OWEN DECICATEDS				(house marked)	
	SHIFT REGISTERS		MM5262	2KX1	Dynamic	4/1.00
MM500H	Dual 25 Bit Dynamic	\$.50			PROM'S	
MM503H	Dual 50 Bit Dynamic	.50	No.	TOTAL PROPERTY.		1000
MM506H	Dual 100 Bit Static	.50	1702A	2048	FAMOS	\$5.9
MM510H	Dual 64 Bit Accumulator	.50	2716	16K*	EPROM(Intel)	29.9
MM5016H	500/512 Bit Dynamic	.89	TMS2516	16K*	EPROM (2716)	19.9
2504(1404A	) 1024 Dynamic	3.95		*Requires	single +5V power supply	
2518	Hex 32 Bit Static	4.95	TMS2532	4KX8	EPROM	89.9
2522	Dual 132 Bit Static	2.95	2708	8K	EPROM	10.9
2524	512 Bit Dynamic	.99	2716 T.I	16K**	EPROM	29.9
2525	1024 Dynamic	2.95			oltages, -5V, +5V, +12V	20.0
2527	Dual 256 Bit Static	2.95	5203	2048	PROM	14.9
	Dual 256 Bit Static	4.00			Tristate Bipolar	3.4
2528		4.00	6301-1(7611			2.9
2529	Dual 240 Bit Static		6330-1(7602		Open C Bipolar	3.9
2532	Quad 80 Bit Static	2.95	82S23	32X8	Open Collector	
3341	Fifo	6.95	82S115	4096	Bipolar	19.9
74LS670	4X4 Register File (TriState)	2.49	82\$123(5610		Tristate	3.9
			74186	512	TTL Open Collector	9.9
	UART'S	The same	74188	256	TTL Open Collector	3.9
A-Y-5-1013	30K BAUD	5.95	74S287	1024	Static	4.9

#### Function Generator Kit



Provides 3 basic waveforms: sine, triangle and square wave. Freq. range from 1 Hz to 100K from 1 Hz to 100K Hz. Output amplitude from 0 volts to over 6 volts (peak to peak). Uses a 12V supply or a ±6V split sup-ply. Includes chip, P.C. Board, com-ponents & instruc-

JE2206B .... \$19.95

#### DIGITAL THERMOMETER KIT



- Dual sensors—control switch for indoor/ outdoor or dual monitoring—extension up to 500 feet
  Continuous LED .8" ht. display Range: 40°F to 199°F / 40°C to 100°C
  Accuracy: 1° nominal Calibrate for East—AC wall adapter incl.

JE300 .....\$39.95

#### **DESIGNERS' SERIES** Blank Desk-Top Electronic Enclosures



- Sliding rear/bottom panel for service and component accessibility.
- Top/bottom panels.080 thk alum. Alodine type 1200 finish (gold tint color) for best paint adhesion after modification.
- Vented top and bottom panels for cooling efficiency.
- Rigid construction provides unlimited applications.

The "DTE" Blank Desk Top Electronic Enclosures are designed to blend and complement today's modern computer equipment and can be used in both industrial and home. The end pieces are precision molded with an internal slot (all around) to accept both top and bottom panels. The panels are then fastened to "", thick tabs inside the end pieces to provide maximum rigidity to the enclosure. For ease of equipment servicing, the rear/bottom panel slides back on slotted tracks while the rest of the enclosure remains intact. Different panel widths may be used while maintaining a common profile outline. The molded end pieces can also be painted to match any panel color scheme.



Enclosure Model No.	Panel Width	PRICE
DTE-8	8.00"	\$29.95
DTE-11	10.65"	\$32.95
DTE-14	14.00"	\$34.95

\$10.00 Min. Order — U.S. Funds Only Calif, Residents Add 6% Sales Tax Postage — Add 5% plus \$1 Insurance (if desired)

Spec Sheets – 25¢ 1981 Catalog Available – Send 41¢ stam





PHONE ORDERS WELCOME (415) 592-8097

MAIL ORDER ELECTRONICS - WORLDWIDE 1355 SHOREWAY ROAD, BELMONT, CA 94002 PRICES SUBJECT TO CHANGE



### National Semiconductor

MM5290J-2 (MK4116/UPD416)...\$6.95 each (8 EACH \$49.95) (100 EACH \$550.00/lot)

MM5298J-3A .......\$3.25 each 8K DYNAMIC RAM (LOW HALF OF MM5290J) 200NS (8 EACH \$23.95) (100 EACH \$250.00/lot)

MM2114L-3 ..........\$6.25 each 4K STATIC RAM (LOW POWER 300NS) (8 EACH \$44.95) (100 EACH \$475.00/lot)



Vacuum Vise Vacuum-based light-duty vise for small components and assemblies. ABS construction. 1½" jaws, 1½" travel. Can be permanently installed.

VV-1.....\$3.49

#### **TRS-80** 16K Conversion Kit

Expand your 4K TRS-80 System to 16K.

\*8 each MM5290-2 (UPD416) (16K Dynamic Rams)

entation for conversion

TRS-16K ......\$49.95

#### JE610 ASCII Encoded Keyboard Kit



The JE610 ASCII Keyboard Kit can be interfaced into most any computer system. The kit comes complete with an industrial grade keyboard switch assembly (62-keys), IC's, sockets, connector, electronic components and a double-sided printed wiring board. The keyboard assembly requires +5V © 150mA and -12V © 10mA for operation. Features: 60 keys generate the 126 characters, upper and lower case ASCII set. Fully buffered. Two user-define keys provided for custom applications. Caps lock for upper-case-only alpha characters. Utilizes a 2376 (40-pin) encoder read-only memory chip. Outputs directly compatible with TTL/DTL or MOS logic arrays. Easy interfacing with a 16-pin dip or 18-pin edge connector.

JE610 (Case not included)

\$79.95

#### Desk-Top Enclosure for JE610 ASCII Encoded Keyboard Kit

Compact desk-top enclosure: Color-coordinated de signer's case with light tan aluminum panels and molded end pieces in mocha brown. Includes mounting hardware Size; 33(4) 9, 24(7), 9, 24(7) Size: 3½"H x 14½"W x 8¾"D.

DTE-AK ......\$49.95 SPECIAL: JE610/DTE-AK PURCHASED TOGETHER (Value \$129.90) . . . . . . . . . . . . . . . . \$124.95

#### **JE600** Hexadecimal Encoder Kit

FULL 8-BIT LATCHED OUTPUT 19-KEY KEYBOARD



The JE600 Encoder Keyboard Kit provides two separate hexadecimal digits produced from sequential key entries to allow direct programming for 8-bit microprocessor or 8-bit memory circuits. Three additional keys are provided for user operations with one having a bistable output available. The outputs are latched and monitored with 9 LED readouts. Also included is a key entry strobe. Features: Full 8-bit latched output for microprocessor use. Three user-define keys with one being bistable operation. Debounce circuit provided for all 19 keys. 9 LED readouts to verify entries. Easy interfacing with standard 16-pin IC connector. Only +5VDC required for opperation.

JE600 (Case not included) \$59.95

Desk-Top Enclosure for JE600 Hexadecimal Keyboard Kit

Compact desk-top exclosure: Color-coordinated designer's case with light tan aluminum panels and molded end pieces in mocha brown. Includes mounting hardware. Size: 3%"H x 8%"W x 8%"D.

SPECIAL: JE600/DTE-HK PURCHASED TOGETHER (Value \$104.90) . . . . . . . . . . . . \$99.95

THINKIN!	7400 TTL SN7470N .29	WYYYYY	JE608 PROGRAMMER 2704/2708 EPROM PROGRAMMER	TELEPHONE/KEYBOARD CHIPS  AY-5-9100  AY-5-9200  AY-5-9200  AY-5-9200  CMOS Clock Generator  AY-5-9206  Keyboard Encoder (88 keys)  11.99
SN7400N .25 SN7401N .20 SN7402N .25 SN7403N .25	SN7472N .29 SN7473N .35 SN7474N .35 SN7475N .49 SN7476N .35	SN74160N .89 SN74161N .89 SN74162N .89 SN74163N .89	Suppared Display Popisters 8 LEO's for live Key entries, 10 LED's 0? 2")     for Address Registers and LEO's for live Key entries, 10 LED's 0? 2")     for Address Registers of LEO's for Bath Memory Register (Soulpsy the centents of the RAMs from the EPROM Cibe.     Powdeparent of incircoprocessor yeartern's presser of arbito cable from the Proparenter panel test socket to the EPROM socket on the microprocessor band.	HD0165 Keyboard Encoder (16 keys) 7.9; 74C922 Keyboard Encoder (16 keys) 5.4; 74C923 Keyboard Encoder (20 keys) 5.7; ICM CHIPS
SN7404N .25 SN7405N .25 SN7406N .35 SN7407N .35	SN7479N 5.00 SN7480N .50 SN7482N .99 SN7483N .69	SN74164N .89 SN74165N .89 SN74166N 1.25 SN74167N 1.95	Stapid checking verification of programmed data changes.     User may move data from a master to RAM's or write into RAM's with keyboard entire dentities (e.p. and down) at any address location.     Standards of PROM Programmer consisting of:     Standards or PROM Programmer consisting of:	ICM7045
SN7408N .25 SN7409N .25 SN7410N .25 SN7411N .25 SN7412N .35	SN7485N .89 SN7486N .35 SN7489N 1.75 SN7490N .49 SN7491N .59	SN74170N 1.95 SN74172N 6.00 SN74173N 1.25 SN74174N .99 SN74175N .89	A 18 ker Hexadecimal Keybourd aismehly, Programmer Baard sasonly, the 4 pieces supplies and a LEOVET Socker Paul Board sessebly. The Test Socket is zero force insertion type, Power requirements: 119VAC, 68Mz, 6W. 6 Compart decision perclaimers (olion-consciliated engines rices with high test panels and molded end pieces in moths brown. Size: 3%" H x 11"W x 18"."O. Works: 5%.	ICM7209   Clock Generator   6.9
SN7412N .35 SN7412N .40 SN7414N .85 SN7416N .29 SN7417N .29	SN7491N .59 SN7492N .43 SN7493N .43 SN7494N .65 SN7495N .65	SN74176N .79 SN74177N .79 SN74179N 1.95 SN74180N .79	The JEDGE EPROM Programmer is a complictely self-contained unit which is independent of computer control and requires no additional systems for its operations. The EPROM can be programmed from the Hexadecimal Keyboard or from a pre-programmed EPROM. The JEGGE Programmer can emulate a programmed EPROM by the use of its internal RAM circuits. This will allow the user of programmer of the programmer contains or Programmer contains a Programmer contains and Programmer contains a Programmer contains and Programmer con	MCM6575 128 X 9 X 7 Alpha Control Char Gen 13.5  MISCELLANEOUS  TL074CN Quad Low Noise bi-fet Op Amp 2.4
SN7420N .20 SN7421N .29 SN7422N .39 SN7423N .25 SN7425N .29	SN7496N .65 SN7497N 3.00 SN74100N 1.49 SN74107N .35 SN74109N .39	SN74181N 1.95 SN74182N .79 SN74184N 2.25 SN74185N 2.25 SN74186N 9.95	with 25 IC's and including power supplies of: -5V, +5V, +12V and +26V. The Hexadecimal Keyboard and LED/Test Socket Panel Board are separate sensibles within the system.  JE608K KIT	TL496CP Single Switching Regulator 1.7 11C90 Divide 10/11 Prescaler 14.9 95H90 Hi-Speed Divide 10/11 Prescaler 11.9
SN7426N .29 SN7427N .25 SN7429N .39 SN7430N .25	SN74116N 1.95 SN74121N .39 SN74122N .39 SN74123N .59	SN74188N 3.95 SN74190N 1.25 SN74191N 1.25 SN74192N .89	JE608A Assembled and tested \$499.95  DISCRETE LEDS	MK50240   Top Octave Freq. Generator   17.5
SN7432N .25 SN7437N .25 SN7438N .40 SN7439N .25 SN7440N .20	SN74125N .49 SN74126N .49 SN74132N .75 SN74136N .75 SN74141N .79	SN74193N .89 SN74194N .89 SN74195N .69 SN74196N .89 SN74197N .89	XC556R         200" red         5/\$1         MV50         .085" red         6/\$1         XC111R         .190" red         5/\$1           XC556G         200" green         4/\$1         XC209R         .125" red         5/\$1         XC111G         .190" green         4/\$1           XC556F         .200" yellow         4/\$1         XC209R         .125" green         4/\$1         XC111G         .190" green         4/\$1           XC556C         .200" clear         4/\$1         XC209Y         .125" yellow         4/\$1         XC111C         .190" clear         4/\$1	MM5330
SN7441N .89 SN7442N .59 SN7443N .75 SN7444N .75	SN74142N 2.95 SN74143N 2.95 SN74144N 2.95 SN74145N .79	SN74198N 1.49 SN74199N 1.49 SN74S200 4.95 SN74251N .99	XC22R .200" red 5/\$1 XC526R .185" red 5/\$1   XC22G .200" green 4/\$1 XC526G .185" green 4/\$1   INFRA-RED LED XC22Y .200" yellow 4/\$1 XC526Y .185" yellow 4/\$1   \( \mu_1 \ndex \nu_2 \ndex \nd	Photo Transistor Opto-Isolator (Same as MCT 2 or 4N25)  49¢ each  \$3.95 each
SN7445N .75 SN7446N .79 SN7447N .69 SN7448N .79 SN7450N .20	SN74147N 1.95 SN74148N 1.29 SN74150N 1.25 SN74151N .59 SN74152N .59	SN74279N .79 SN74283N 2.25 SN74284N 3.95 SN74285N 3.95 SN74365N .69	C.A Common Anode	TV GAME CHIP AND CRYSTAL AY-3-8500-1 and 2.01 MHZ Crystal (Chip & Crystal includes score display, 6 games) and select angles, etc. 7.95/s
SN7451N .20 SN7453N .20 SN7454N .20 SN7459A .25 SN7460N .20	SN74153N .79 SN74154N 1.25 SN74155N .79 SN74156N .79 SN74157N .65	SN74366N .69 SN74367N .69 SN74368N .69 SN74390N 1.95 SN74393N 1.95	MAN 3 C.C.—red .125 .25 DL741 C.A.—red .500 L25 MAN 4 C.C.—red .187 1.95 DL746 C.A.—red ± 1 .530 L49 MAN 7.0 C.A.—green .300 L25 DL747 C.A.—red ± 0.500 L49 MAN 7.7 C.A.—green .300 .25 DL747 C.A.—red .500 L49 MAN 7.7 C.A.—red .500 L49	XR205 \$8.40 EXAR XR2242CP 1. XR210 4.40 XR215 4.40 EXAR XR2567 3. XR2567 2.
CD4000 .39 CD4001 .39 CD4002 .39	CMOS CD4028 .89	CD4070 .55 CD4071 .49 CD4072 .49	MAN 72	XR-L555
CD4006 1.19 CD4007 .25 CD4009 .49 CD4010 .49 CD4011 .39	CD4029 1.49 CD4030 .49 CD4035 .99 CD4040 1.49 CD4041 1.49	CD4076 1,39 CD4081 .39 CD4082 .39 CD4093 .99 CD4098 1.19	MAN 3530 C.A.—orange ±1 .300 .99 FND507 C.A. (FND510) .500 .99 MAN 3640 (C.C.—orange .300 .99 5082-7730 C.A.—red .300 .99 MAN 4610 C.A.—orange .300 .99 HDSF>-3400 C.A.—red .800 1.50 MAN 4810 C.A.—yellow .400 .99 HDSF>-3400 C.C.—red .800 1.50	XR567CT 1.25
CD4012 .25 CD4013 .49 CD4014 1.39 CD4015 1.19	CD4042 .99 CD4043 .89 CD4044 .89 CD4046 1.79	MC14409 14.95 MC14410 14.95 MC14411 14.95 MC14419 4.95	MAN 4840         C.C.—yellow         .400         .99         5082-7613         C.C., R.H.D.—red         .300         1.25           MAN 6610         C.A.—orange ± 1         .560         .99         5082-7620         C.A., L.H.D.—yel         .300         1.25           MAN 6630         C.A.—orange ± D         .500         .99         5082-7623         C.C., R.H.D.—yel         .300         1.25           MAN 6630         C.C.—orange ± D         .500         .99         5082-7730         C.A., L.H.D.—red         .300         1.25           MAN 6530         C.C.—orange ± 1         .560         .99         5082-7731         C.A., L.H.D.—red         .300         1.25	DIODES   TYPE   VOLTS W   FINANCE   100 PIV1 AMP   12
CD4016 .59 CD4017 1.19 CD4018 .99 CD4019 .49 CD4020 1.19	CD4047 2.50 CD4048 1.35 CD4049 .49 CD4050 .69 CD4051 1.19	MC14433 13.95 MC14506 .75 MC14507 .99 MC14562 11.95 MC14583 2.49	MAN 6500         C.A.—orange         .560         .99         5082-7751         C.A., L.H.D.—red         .430         1.25           MAN 6710         C.A.=red—DD         .560         .99         5082-7751         C.A., R.H.D.—red         .430         1.25           MAN 6760         C.C.—red         1         .560         .99         5082-7761         C.C., R.H.D.—red         .430         1.25           MAN 6760         C.A.—red         .560         .99         5082-7300         4x7 sgl. dig, BHDP         .600         19.95           MAN 6760         C.C.—red         .560         .99         5082-7302         4x7 sgl. dig, LHDP         .600         19.95           MAN 6780         C.C.—red         .560         .99         5082-7302         4x7 sgl. dig, LHDP         .600         19.95	114751 5.1 400cm 4/1.00 114005 600 PIV1 AMP 10 114752 5.6 400cm 4/1.00 114006 800 PIV1 AMP 10 114753 6.2 400cm 4/1.00 114006 800 PIV1 AMP 10 114754 6.8 400cm 4/1.00 114007 1000 PIV1 AMP 10 114754 10.8 400cm 4/1.00 114006 50 2000cm 6 114757 9.0 400cm 4/1.00 114016 75 10cm 15
CD4021 1.39 CD4022 1.19 CD4023 .29 CD4024 .79 CD4025 .23	CD4053 1.19 CD4056 2.95 CD4059 9.95 CD4060 1.49	CD4508 3,95 CD4510 1.39 CD4511 1.29 CD4515 2.95 CD4518 1.79	DL701 C.A.—red ± 1 .300 .99 5082-7304 Overnge.char.(±1) .600 15.00 DL704 C.C.—red .300 .99 5082-7340 4x7 sgl. dig. hex600 22.50	1N759         12.0         400m         4/1.00         1N4154         35         10m         12           1N959         8.2         400m         4/1.00         1N4733         5.1         1w         4,           1N965         15         400m         4/1.00         1N4734         5.6         1w         4,           1N5232         5.6         500m         4/1.00         1N4735         6.2         1w         4,
C D4026 2.95 C D4027 .69 74C00 .39 74C02 .39	CD4066 .79 CD4068 .39 CD4069 .45	CD4520 1.29 CD4566 2.25 74C163 1.69 74C164 1.59	CA3013T 2.15 CA3082N 2.00 CMITS/JUNEERS MMS309 4.95 MC1408L7 4.95 CA303ST 2.48 CA3088N 3.85 MMS728 2.95 MMS311 4.95 MC1408L8 5.75 CA303ST 1.85 CA3088N 3.85 MMS728 2.95 MMS311 4.95 MC1408L8 5.75 CA303ST 1.85 CA3088N 3.85 MMS728 2.90 MMS312 4.95 MC1408L8 5.75 CA303ST 1.85 CA3088N 3.85 MMS728 2.90 MMS312 4.95 MC1408L8 5.75 CA303ST 1.85 CA308SN 3.85 MMS728 2.90 MMS312 4.95 MC1408L8 5.75 CA303ST 1.85 CA308SN 3.85 MMS728 2.90 MMS312 4.95 MC1408L8 5.75 CA303ST 1.85 CA303ST 1.	1N5235 6.8 500m 4/1.00 1N4738 8.2 1w 4/1.01 1N5235 7.5 500m 4/1.00 1N4742 12 1w 4/1.01 1N5242 12 500m 4/1.00 1N4744 15 1w 4/1.01 1N5245 15 500m 4/1.00 1N4744 15 1w 4/1.01 1N45245 15 500m 4/1.00 1N4745 15 50 0M 4/1.00 1N4745 15 10
74C04 .39 74C08 .39 74C10 .39 74C14 .75	74C85 1.95 74C90 1.29 74C93 1.29 74C95 1.59 74C107 1.89	74C173 1.39 74C192 1.69 74C193 1.69 74C195 1.59	CA3046N 1.30 CA3130T 1.39 DM8865 1.00 MM5314 4.95 MC3222* 2.95 MC43050N 1.25 CA3404T 1.25 DM8887 .75 MM5318 9.95 MC4016(P415)50 CA3060N 3.25 CA3401N 5.9 9374 7-5e9. MM5318 9.95 MC4016(P416)7.50 MM5318 9.95 MM5318 9.95 MC4016(P416)7.50 MM5318 9.95 MC4016(P416)7.50 MM5318 9.95 MC4016(P416)7.50 MM5318 9.95 MM5318 9.95 MC4016(P416)7.50 MM5318 9.95	1M456         25         40m         6/1.00         1N1184         100 PN 35 AMP           1M458         150         7m         6/1.00         1N1185         150 PN 35 AMP           1M488A         180         10m         5/1.00         1N1186         200 PN 35 AMP           1M4001         50 PIV 1 AMP         12/1.00         1N1188         400 PIV 35 AMP
74C20 .39 74C30 .39 74C42 1.39 74C48 1.95 74C73 .79	74C151 2.95 74C154 3.95 74C157 2.25 74C160 1.69	74C923 5.75 74C925 7.50 74C926 7.50 80C95 .79	CA308IN 2.00 CA3600N 3.50 LED driver 1.50 MM5307 4.55 MC404P 4.50  LOW PROFILE (TIN) SOCKETS SOLDERTAIL STANDARD (TIN)	SCR AND FW BRIDGE RECTIFIERS   C36D   15A @ 400V SCR (2N1849)   \$1 C36M 35A @ 600V SCR   2 C166B1 3.6A @ 200V SCR   2 CN2328 1.6A @ 300V SCR   3 CR
24C74 .79 8MG 1.75 .M106H .99 .M300H .80	LINEAR	80C97 .79 LM710N .79 LM711N .39 LM723N/H .55	8 pin LP .17 .16 .15 14 pin ST .27 .25 .24 15 pin LP .20 .19 .18 16 pin ST .30 .27 .25 .24 15 pin LP .22 .21 .20 15 pin ST .30 .27 .25	MDA 980-1 12A @ 50V FW Bridge Rec.  TRANSISTORS 2N3904 4  MPSA05 3/1.00 2N3055 .89 2N3905 4
.M301CN/H .35 .M302H 1.75 .M304H 1.49 .M305H .79 .M307CN/H .45	LM340K-18 1.35 LM340K-24 1.35 LM340T-5 1.25 LM340T-6 1.25	LM733N 1.00 LM739N 1.19 LM741CN/H .35 LM741-14N .39 LM747N/H .79	18 pin LP .22 .28 .27 .24 pin ST .35 .32 .30 18 pin LP .29 .28 .27 .24 pin ST .49 .45 .42 22 pin LP .37 .36 .35 .36 pin ST .99 .90 .81 22 pin LP .33 .37 .36 .35 .36 pin ST .139 .1.26 .1.15 28 pin LP .45 .44 .43 .49 pin ST .1.59 .1.45 .1.30	MPSA06   3/1.00   MJE3055   1.00   2N3906   4/1.01   1/1.00   2N3906   4/1.00   2N4013   1/1.00   2N398   4/1.00   2N4013   4/1.00   2N398   4/1.00   2N4123   4/1.00   4/1.
M308CN/H 1.00 M309H 1.10 M309K 1.25 M310CN 1.95 M311N/H .90	LM340T-8 1.25 LM340T-12 1.25 LM340T-15 1.25 LM340T-18 1.25 LM340T-24 1.25	LM748N/H .59 LM1310N 1.95 LM1458CN/H .59 MC1488N 1.95 MC1489N 1.95	36 pin LP .60 .59 .58 40 pin LP .63 .52 .61 WIRE WRAP SOCKETS (GOLD) LEVEL #3 SOLDERTAIL (GOLD) 1-24 25-49 50-100	40673 1.75 PN3589 4/1.00 2N4400 4, 2N41818 2/1.00 MPS3638A 4/1.00 2N4401 4, 2N2219 2/1.00 MPS3638A 4/1.00 2N4402 4, 2N2214 3/1.00 MPS3702 4/1.00 2N4402 4, 2N22214 3/1.00 MPS3704 4/1.00 2N4403 4, 2N22214 3/1.00 MPS3704 4/1.00 MPS3704 4/1
.M312H 1.95 .M317K 3.95 .M318C N/H 1.95 .M319N 1.30	LM358 N 1.00 LM370 N 1.95 LM373 N 3.25 LM377 N 2.95	LM1496N .95 LM1556V 1.75 MC1741SCP 3.00 LM2111N 1.95	STANDARD   8 pin ww   59   .54   .49	2N2222A 3/1.00 MPS3704 4/1.00 2N4409 4, PN2222 Plastic 6/1.00 2N3705 4/1.00 2N5086 4, 2N2369A 2/1.00 MPS3705 4/1.00 2N5087 4, MFS2369 4/1.00 2N3706 4/1.00 2N5088 4, 2N2484 4/1.00 MPS3706 4/1.00 2N5088 4, 2N2484 4/1.00 MPS3706 4/1.00 2N5089 4, 2N2484 4/1.00 MPS3706 4/1.00 MPS3
M320K-5 1.35 M320K-5.2 1.35 M320K-12 1.25 M320K-15 1.35 M320K-18 1.35	LM380N 1.25 LM380CN .99 LM381N 1.79 LM382N 1.79 NE510A 6.00	LM2901N 1.95 LM3053N 1.50 LM3065N 1.49 LM3900N(3401).59 LM3905N 1.49	14 pin SG     .49     .45     .41     13 pin WW     .99     .90     .81       16 pin SG     .54     .49     .44     20 pin WW     1.19     1.08     .59       18 pin SG     .59     .53     .48     22 pin WW     1.49     1.35     1.23       24 pin SG     .79     .75     .69     24 pin WW     1.39     1.26     1.14       28 pin SG     1.10     1.00     .90     28 pin WW     1.69     1.53     1.38	2N2906 2/1.00 2N3707 4/1.00 2N5129 4/ 2N2907 3/1.00 2N3711 4/1.00 PN5134 4/ 2N2925 4/1.00 2N3724A .65 PN5138 4/ MJE2955 1.25 2N3725A 1.00 2N5139 4/
M320K-24 1.35 M320T-5 1.25 M320T-5.2 1.25 M320T-8 1.25 M320T-12 1.25	NE529A 4.95 NE531H/V 3.95 NE536T 6.00 NE540 6.00 NE544N 4.95	LM3909N 1.25 MC5558V .59 8038B 4.95 LM75450N .49 75451CN .39	36 pin SG 1.65 1.40 1.26 36 pin WW 2.19 1.99 1.79 40 pin SG 1.75 1.59 1.45 40 pin WW 2.29 2.09 1.89	2N3053 2/1.00 2N3772 2.255 2N5210 4 2N520 4 2N520 2N520 2N520 4 /1.00 2N549 3, 2N5951 2, 2N5951 2N520
M320T-15 1.25 M320T-18 1.25 M320T-24 1.25 M323K-5 5.95	NE550N 1.30 NE555V .39 NE556N .99 NE560B 5.00	75452CN .39 75453CN .39 75454CN .39 75491CN .79	1/4 WATT RESISTOR ASSORTMENTS — 5%  10 0HM 12 0HM 15 0HM 18 0HM 22 0HM 50 0HM 5	1-9 10-99 100 - 1-9 10-99 1 10 pf .08 .06 .05 .001 μF .08 .06 .06 .22 pf .08 .06 .05 .0047 μF .08 .06 .06 .07 .0047 μF .08 .06 .06 .05 .01 μF .08 .06 .05 .00 .04 μF .08 .06 .05 .00 .00 .00 μF .08 .06 .05 .00 μF .08 .06 .05 .00 .00 μF .08 .06 .05 .00 μF .08 .06 .00 μF .08 .06 .00 .00 μF .08 .00 μF
M324N .99 M339N .99 M340K-5 1.35 M340K-6 1.35 M340K-8 1.35	NE562B 5.00 LM565N/H 1.25 LM566CN 1.75 LM567V/H .99 NE570N 4.95	75492CN .89 75493N 1.25 75494CN 1.25 RC4136 1.25 RC4151 3.95	ASST. 2 5 ea. 180 0HM 220 0HM 270 0HM 330 0HM 390 0HM 50 PC\$ \$1.95 470 0HM 560 0HM 660 0HM 820 0HM 1 K ASST. 3 5 ea. 1.2% 1.5% 1.8% 2.2% 2.7% 50 PC\$ \$1.95	470 pf .06 .06 .1μ 1.15 .12 . 100 VOLT MYLAR FILM CAPACITORS 001mf .12 .10 .07 .022mf .13 .11
.M340K-12 1.35 .M340K-15 1.35 74LS00 .35 74LS01 .35	LM703CN/H .69 LM709N/H .29 <b>74LS00TTL</b> 74LS51 .29	RC4194 4.95 RC4195 4.49 74LS139 1.05 74LS151 1.05	3.3k 3.9k 4.7k 5.6k 6.8k ASST. 4 5 ea. 8.2k 10k 12k 15k 18k 50 PCS \$1.95 22k 27k 33k 39k 47k ASST. 5 5 ea. 56k 68k 82k 100k 120k 50 PCS \$1.95	0022 12 10 07 047mt 221 17 0047mt 12 1 17 0047mt 12 10 07 1mt 27 23 01mt 12 10 07 1mt 27 23 01mt 12 10 07 22mt 33 27 13 12 12 13 13 12 13 13 14 12 13 15 15 15 15 15 15 15 15 15 15 15 15 15
74LS02 .35 74LS03 .35 74LS04 .42 .74LS05 .42 74LS08 .35	74LS54 .29 74LS55 .29 74LS73 .54 74LS74 .54 74LS75 .71	74LS155 1.05 74LS157 1.05 74LS160 1.15 74LS161 1.39 74LS162 1.25	150K   180K   220K   270K   330K   330K   470K   560K   680K   820K   50 PC\$   \$1.95	1.7529 39 .34 .29 1.5/35V 41 .37 .15/35V 41 .37 .25 .25 .25 .25 .25 .25 .25 .25 .25 .25
74LS09 .42 74LS10 .35 74LS11 .75 74LS13 .59	74LS76 .54 74LS78 .49 74LS83 1.05 74LS85 1.50	74LS163 1.39 74LS164 1.50 74LS175 1.25 74LS181 2.49	ASST. 8R Includes Resistor Assortments 1 - 7 (350 PCS.) \$10.95 ea.  \$10.00 Min. Order – U.S. Funds Only Calif. Residents Add 6% Sales Tax 1981 Catalog Available – Send 41¢ stamp	MINIATURE ALUMINUM ELECTROLYTIC CAPACITORS Axial Lead A7/50V 16 .14 .10 .47/25V 15 .13 .1
74LS14 1.25 74LS15 .35 74LS20 .35 74LS21 .35 74LS22 .35	74LS86 .54 74LS90 .71 74LS92 .90 74LS93 .90 74LS95 .99	74LS190 1.25 74LS191 1.25 74LS192 1.39 74LS193 1.39 74LS194 1.39	Postage — Add 5% plus \$1 Insurance (if desired)	1.0.650V 19 16 12 47/50V 16 14 1 3.3.550V 17 15 11 1.0/16V 15 13 1 4.7/25V 18 15 11 1.0/50V 16 1.4 1 10/25V 18 15 11 1.0/50V 17 15 1 10/50V 19 16 12 4.7/16V 15 13 1 22/25V 19 16 12 4.7/16V 16 14 1 22/25V 19 16 12 4.7/16V 17 15 13
74LS26 .35 74LS27 .35 74LS28 .35 74LS30 .35 74LS32 .42	74LS96 1.15 74LS107 .54 74LS109 .54 74LS112 .54	74LS195 1.39 74LS253 1.25 74LS257 1.05 74LS258 1.75	ELECTRONICS WELCOME (415) 592-8097	47/25V .25 .21 .19 10/16V .15 .13 .1 47/50V .29 .25 .23 10/25V .16 .14 .1 100/25V .28 .24 .22 10/50V .17 .15 .1 100/50V .41 .37 .34 47/50V .25 .21 .1
74LS32 .42 74LS37 .45 74LS40 .35	74LS123 1.50 74LS125 1.05 74LS132 .99 74LS136 .59	74L,5260 .83 74L,S279 .90 74L,S367 .75 74L,S368 .75	MAIL ORDER ELECTRONICS — WORLDWIDE  1355 SHOREWAY ROAD, BELMONT, CA 94002   PRICES SUBJECT TO CHANGE	220/25V 39 34 33 100/16V 21 17 1. 220/50V 49 45 41 100/25V 25 23 2 470/25V 54 49 45 100/50V 37 34 3. 1000/16V 79 69 61 220/16V 25 21 1. 2200/16V 89 79 69 470/25V 35 31 3.



S-100 MEMORY BOARD

\$49995

California Computer Systems



8038C

#### **VOLTAGE REGULATORS**

95€

#### **EPROM'S**

2708 \$6.75 1K×8 450NS 8 FOR \$48.50 2716 \$18.95 16K(2K×8)450NS 2732 \$ FOR \$142.95 32K (4096×8)

Take 20% off LS prices

74LS158 74LS161 74LS161 74LS163 74LS163 74LS164 74LS165 74LS175 74LS175 74LS175 74LS175 74LS195 74LS217 74LS221 74LS240 74LS243 74LS24

### SOROC



video



12" BLACK & WHITE LOW COST VIDEO

#### APPLE II Computer with full 48K of memory! \$109900 APPLE EXPANSION KIT Plexiglass cover as shown 16K Memory Add-On MEMORY AD INCLUDES INS RAMS. AND JU NO TOOLS REC 2495

#### S-100 MEMORY BOARD



ASSEMBLED 24900

California Computer Systems

555 Timer 27¢

8212 1/0 port \$295

#### **DUST COVERS**

APPLE DISK \$ 3.75 \$ 8.75 APPLE KEYBOARD TRS-80 KEYBOARD \$ 7.75 TRS-80 RECORDER \$ 3.75 \$ 3.75 TRS-80 SINGLE DISK TRS-80 DOUBLE DISK \$ 6.75 \$ 7.75 PET DISK PET TERMINAL/COMP. \$15.75 NORTHSTAR COMPUTER \$11.75 SOROC TERMINAL \$10.75

#### APPLE GAME PORT REMOTE PLUG-IN EXPANDER with

\$3995

SELECTOR! Allows continuous

connection of any three

of the Apple game port options.



DROC

#### HOME STUDY COURSE ON CASSETTE



SI-INTRODUCTION TO **MICROPROCESSORS** 

orNon-Specialists.Course contains: Definitions\*Application\*Evaluation Terms\*SystemComponents\*2.5 hrs.

**TRS-80** 

With jumpers and

instructions

\$2995 NO TECHNICAL BACKGROUND ASSUMED

\$2995



base2, inc.





S2-PROGRAMMING **MICROPROCESSORS** 

For the student who has completed S-1. GOAL: Toprovide an overall and practical understanding of the concepts of Micro Computer Programming. 2.5 hours.









V 297 COMPUTER Pol

'/C" 16 K Memory Add-On \$4995 KIT Master

8 outlet 6 switched

EMI filtered \$8750 Circuit Breaker

1980

\$4795

1971 SOUTH STATE COLLEGE VISA MASTER CHARGE CHECK OR M O NO COD

(714) 937-0637

We stock and sell over 12,000 types of semi-conductors - CAL RES ADD 6%

ANAHEIM, CA. 92806 MINIMUM ORDER \$1000 ADD \$1 50 FOR FRT



10140.51199°

#### "TTI"

		-	
SN7400N	.20	SN7475N	.36
SN7402N	.22	SN7482N	1.05
SN7404N	.22	SN7492N	.50
SN7408N	.26	SN7493N	.48
SN7410N	.22	SN7495N	.60
SN7412N	.28	SN7496N	.70
SN7413N	.35	SN74122N	.39
SN7414N	.55	SN74136N	.95
SN7416N	.29	SN74141N	.69
SN7417N	.29	SN74151N	.65
SN7423N	.28	SN74153N	.65
SN7425N	.25	SN74154N	1.25
SN7430N	.23	SN74155N	.80
SN7437N	.29	SN74157N	.69
SN7438N	.30	SN74160N	.95
SN7440N	.22	SN74161N	.90
SN7442N	.57	SN74163N	.85
SN7443N	.78	SN74164N	.87
SN7445N	.78	SN74165N	.87
SN7451N	.20	SN74174N	.99
SN7454N	.20	SN74175N	.89
SN7474N	.36	SN74180N	.75

MSM5832 MICROPROCESSOR REAL-TIME CLOCK/CALENDAR

GENERAL DESCRIPTION

\$745

Start learning and computing for only \$129.95 with a Netronics 8085-based computer kit. Then expand it in low-cost steps to a business/development system with 64k or more RAM, 8" floppy disk drives, hard disks and multi-terminal I/O.

**Special!** Full 8" floppy, 64k system for less than the price of a mini! Only **\$1499.95!** (Also available wired & tested, \$1799.95)

Imagine — for only \$129.95 you can own the starting level of Explorer/85, a computer that's expandable into full business/development capabilities — a computer that can be your beginner system, an OEM controller, or an IBM-formatted 8" disk small business system. From the first day you own Explorer/85, you begin computing on a significant level, and applying princicomputing on a significant level, and applying princi-ples discussed in leading computer magazines. Ex-plorer/85 features the advanced Intel 8085 cpu, which is 100% compatible with the older 8080A. It offers on-board S-100 bus expansion, Microsoft BASIC in ROM, board S-100 bus expansion, Microsoft BASIC in ROM, plus instant conversion to mass storage disk memory with standard IBM-formatted 8" disks. All for only \$129.95, plus the cost of power supply, keyboard/terminal and RF modulator if you don't have them (see our remarkable prices below for these and other, accessories). With a Hex Keypad/display front panel, Level "A" can be programmed with no need for a terminal, ideal for a controller, OEM, or a real low-cost start.



Level "A" is a complete operating system, perfect for beginners, hobbyists, industrial controller

LEVEL "A" SPECIFICATIONS

Explorer/85's Level "A" system features the advanced Intel 8085 cpu, an 8355 ROM with 2k deluxe monitor/ operating system, and an advanced 8155 RAM I/O . . . all on a single motherboard with room for RAM/ROM/PROM/EPROM and S-100 expansion, plus generous

PROM/EPROM and S-100 expansion, plus generous prototyping space.

PC Board: Glass epoxy, plated through holes with solder mask. • 1/O: Provisions for 25-pin (DB25) connector for terminal serial 1/O. which can also support a paper tape reader ... cassette tape recorder input and output ... cassette tape recorder input and output ... cassette tape control output ... LED output indicator on SOD (serial output) line ... printer interface (less drivers) ... total of four 8-bit plus one 6-bit 1/O ports. • Crystal Frequency: 6.144 MHz. • Control Switches: Reset and user (RST 7.5) interrupt ... additional provisions for RST 5.5, 6.5 and TRAP interrupts onboard. • Counter/Timer: Programmable, 14-bit binary. • System RAM: 256 bytes located at F800, ideal for smaller systems and for use as an isolated stack area in expanded systems ... RAM expandable to 64K via S-100 bus or 4k on motherboard.

System Monitor (Terminal Version): 2k bytes of deluxe system monitor ROM located at F800, leaving 8000 fer for user RAM/ROM. Features include tape load with labeling ... examine/change contents of

MMM free for user RAM/ROM. Features include tape load with labeling ... examine/change contents of memory ... insert data ... warm start ... examine and change all registers ... single step with register display at each break point, a debugging/training feature ... go to execution address ... move blocks of memory from one location to another ... fill blocks of memory with a constant ... display blocks of memory ... automatic baud rate selection to 9600 baud ... variable display line length control (1-255 characters/line) ... channelized I/O monitor routine with 8-bit parallel output for high-speed printer ... serial console in and console out channel so that monitor can communicate with I/O out channel so that monitor can communicate with I/O

System Monitor (Hex Keypad/Display Version): Tape load with labeling . . . tape dump with labeling . . . examine/change contents of memory . . . insert data warm start . . . examine and change all registers . .

☐ Hex Keypad/Display kit . . . \$69.95 plus \$2 post. & insur.

Full 8" disk system for less than the price of a mini (shown with Netronics Explorer/85 computer and new terminal). System features floppy drive from Control Data Corp., world's largest maker of mory storage systems (not a hobby brand!)



Level "A" With Hex Keypad/Display

single step with register display at each break point . . . go to execution address. Level "A" in this version makes a perfect controller for industrial applications, and is programmed using the Netronics Hex Keypad/Display. It is low cost, perfect for beginners. HEX KEYPAD/DISPLAY SPECIFICATIONS

Calculator type keypad with 24 system-defined and 16 user-defined keys. Six digit calculator-type display, that displays full address plus data as well as register and status information.

and status information.

LEVEL "B" SPECIFICATIONS

Level "B" provides the S-100 signals plus buffers/
drivers to support up to six S-100 bus boards, and includes: address decoding for onboard 4k RAM expansion selectable in 4k blocks . . . address decoding for onboard 8k EPROM expansion selectable in 8k blocks
... address and data bus drivers for onboard expansion wait state generator (jumper selectable), to allow the use of slower memories . . . two separate 5 volt regula-

LEVEL "C" SPECIFICATIONS

Level "C" expands Explorer/85's motherboard with a Level "C" expands Explorer/85's motherboard with a card cage, allowing you to plug up to six S-100 cards directly into the motherboard. Both cage and card are neatly contained inside Explorer's deluxe steel cabinet. Level "C" includes a sheet metal superstructure, a 5-card, gold plated S-100 extension PC board that plugs into the motherboard. Just add required number of S-100 connectors.



LEVEL "D" SPECIFICATIONS

Level "D" provides 4k of RAM, power supply regula-tion, filtering decoupling components and sockets to expand your Explorer/85 memory to 4k (plus the origi-

Explorer/85 With Level "C" Card Cage. nal 256 bytes located in the 8155A). The static RAM can be located anywhere from 1010100 to EFFF in 4k blocks.

LEVEL "E" SPECIFICATIONS

Level "E" adds sockets for 8k of EPROM to use the popular Intel 2716 or the TI 2516. It includes all sockets, popular Intel 27 to 6 rtn e1 12 516. It includes all sockets, power supply regulator, heat sink, filtering and decoupling components. Sockets may also be used for 2k x 8 RAM IC's (allowing for up to 12k of onboard RAM).

DISK DRIVE SPECIFICATIONS

8" CONTROL DATA CORP.
professional drive.
(SD, 802.032 bytes (DD).
L SI controller.

professional drive. LSI controller.

unformatted.

Write protect. Single or double density · Access time: 25ms (one

#### DISK CONTROLLER/ I/O BOARD SPECIFICATIONS

- 2716 PROM socket included Controls up to four 8" drive
   1771A LSI (SD) floppy disk for use in custom
  applications.

  Onboard crystal controlled.
  Onboard I/O baud rate

- controller.

  Onboard data separator (IBM compatible).

  2 Serial I/O ports

  Autoboot to disk system
  - - generators to 9600 baud
       Double-sided PC board

DISK DRIVE CABINET/POWER SUPPLY

Deluxe steel cabinet with indivi imum reliability and stability.

#### ORDER A COORDINATED **EXPLORER/85 APPLICATIONS**

Beginner's Pak (Save \$26.00!) - Buy Level "A" (Ter-

Beginner's Pak (Save \$26.00!) — Buy Level "A" (Terminal Version) with Monitor Source Listing and AP-15-amp Power Supply: (regular price \$199.95), now at SPECIAL PRICE: \$169.95 plus post. & insur. Experimenter's Pak II (Save \$33.40!) — Buy Level "A" (Hex Keypad/Display Version) with Hex Keypad/Display Version) with Hex Keypad/Display. Intel 8085 User Manual, Level "A" Hex Monitor Source Listing, and AP-15-amp Power Supply: (regular price \$279.35), all at SPECIAL PRICE: \$219.95 plus post. & insur. Special Microsoft BASIC Pak (Save \$103.00!) — Includes Level "A" (Terminal Version), Level "B" Level "B" (4 RAM), Level "E", 8k Microsoft in ROM, Intel 8085 User Manual, Level "A" Monitor Source Listing, and AP-15-amp Power Supply: (regular price \$439.70), now yours at SPECIAL PRICE: \$329.95 plus post. & insur.

9.95 plus post. & insur.
ADD A TERMINAL WITH CABINET,
GET A FREE RF MODULATOR: Save over \$114 at this SPECIAL PRICE: \$499.95 plus post. & insur

plus post. & insur.

Special 8" Disk Edition Explorer/85 (Save over \$104!)

— Includes disk-version Level "A". Level "B", two

S-100 connectors and brackets, disk controller, 64k

RAM, AP-15-amp power supply. Explorer/85 deluxe

steel cabinet, cabinet fan, 8" SD/DD disk drive from

famous CONTROL DATA CORP. (not a hobby

brand!), drive cabinet with power supply, and drive

cable set-up for two drives. This package includes

everything but terminal and printers (see coupon for

them). Regular price \$1630.30, all yours in kit at

SPECIAL PRICE: \$1499.95 plus post. & insur. Wired

and tested, only \$1799.95. and tested, only \$1799.95.

Special! Complete Business Software Pak (Save \$625.00!) — Includes CP/M 2.0. Microsoft BASIC. General Ledger. Accounts Receivable. Accounts Payable. Payroll Package: (regular price \$1325). yours now at SPECIAL PRICE: \$699.95.

Dept. K10 Please send the items checked below:	☐ AP-1 Power Supply Kit ±8V @ 5 amps) in deluxe steel cabinet	☐ Disk Controller Board With I/O Ports \$199.95 plus \$2 post.
☐ Explorer/85 Level "A" kit (Terminal Version) \$129.95 plus	\$39.95 plus \$2 post. & insur.	& insur.
\$3 post. & insur.	☐ Gold Plated S-100 Bus Connectors \$4.85 each, postpaid.	□ Special: Complete Business Software Pak (see above)
☐ Explorer/85 Level "A" kit (Hex Keypad/Display Version)	☐ RF Modulator kit (allows you to use your TV set as a monitor)	\$699.96 postpaid.
\$129.95 plus \$3 post. & insur.	\$8.95 postpaid.	SOLD SEPARATELY:
□ 8k Microsoft BASIC on cassette tape. \$64.95 postpaid.	☐ 16k RAM kit (S-100 board expands to 64k) \$199.95 plus \$2	☐ CP/M 1.4 \$100 postpaid.
☐ 8k Microsoft BASIC in ROM kit (requires Levels "B", "D" and	post. & insur.	☐ CP/M 2.0 \$150 postpaid.
"E") <b>\$99.95</b> plus \$2 post. & insur.	☐ 32k RAM kit \$299.95 plus \$2 post. & insur.	☐ Microsoft BASIC \$325 postpaid.
□ Level "B" (S-100) kit \$49.95 plus \$2 post. & insur.	☐ 48k RAM kit \$399.95 plus \$2 post. & insur.	☐ Intel 8085 cpu User Manual \$7.50 postpaid.
☐ Level "C" (S-100 6-card expander) kit \$39.95 plus \$2 post.	☐ 64k RAM kit \$499.95 plus \$2 post. & insur.	☐ Level "A" Monitor Source Listing \$25 postpaid.
& insur.	☐ 16k RAM Expansion kit (to expand any of the above in 16k	Continental U.S.A. Credit Card Buyers Outside Connecticut
□ Level "D" (4k RAM) kit \$69.95 plus \$2 post. & insur. □ Level "E" (EPROM/ROM) kit \$5.95 plus 50¢ p&h.	blocks up to 64k) \$99.95 plus \$2 post. & insur. each.  ☐ Intel 8085 cpu Users' Manual \$7.50 postpaid.	CALL TOLL FREE: 800-243-7428
Deluxe Steel Cabinet for Explorer/85 \$49.95 plus \$3 post.	☐ 12" Video Monitor (10MHz bandwidth) \$139.95 plus \$5	To Order From Connecticut Or For Technical
& insur.	post, & insur.	Assistance, call (203) 354-9375
☐ Fan For Cabinet \$15.00 plus \$1.50 post. & insur.	☐ Beginner's Pak (see above) \$169.95 plus \$4 post. & insur.	
☐ ASCII Keyboard/Computer Terminal kit: features a full-128	☐ Experimenter's Pak (see above) \$219.95 plus \$6 post. &	Total Enclosed (Conn res. add sales tax) \$
character set, u&l case; full cursor control; 75 ohm video	insur.	Paid By:
output; convertible to baudot output; selectable baud rate.	□ Special Microsoft BASIC Pak Without Terminal (see above)	☐ Personal Check ☐ Cashier's Check/Money Order
RS232-C or 20 ma. I/O, 32 or 64 character by 16 line formats.	\$329.95 plus \$7 post. & insur.	□ VISA □ Master Charge (Bank No)
and can be used with either a CRT monitor or a TV set (if you	□ Same as above, plus ASCII Keyboard Terminal With Cabinet,	Acct. No Exp. Date
have an RF modulator) \$149.95 plus \$3.00 post. & insur.	Get Free RF Modulator (see above) \$499.95 plus \$10 post.	Signature
□ DeLuxe Steel Cabinet for ASCII keyboard/terminal	& insur.	Print
\$19.95 plus \$2.50 post. & insur.	Special 8" Disk Edition Explorer/85 (see above) \$1499.95	Name
New! Terminal/Monitor: (See photo) Same features as above, except 12" monitor with keyboard and terminal is in deluxe	plus \$26 post. & insur.	Address
single cabinet; kit \$399.95 plus \$7 post. & insur.	<ul> <li>□ Wired &amp; Tested \$1799.95 plus \$26 post. &amp; insur.</li> <li>□ Extra 8" CDC Floppy Drives \$499.95 plus \$12 post. &amp; insur.</li> </ul>	
☐ Hazeltine terminals: Our prices too low to quote — CALL US	☐ Cabinet & Power Supply For Drive \$69.95 plus \$3 post. &	CityStateZip
Lear-Sigler terminals/printers: Our prices too low to quote:	insur.	
CALLUS	Drive Cable Cet up For Two Drives \$25 plus \$1.50 page 8	NETRONICS Research & Development Ltd.

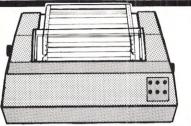
333 Litchfield Road, New Milford, CT 06776

# ELECTRONICS, INC.

Call Toll-Free: USA (800) 423-5387 In California: (800) 382-3651 Local & Outside USA: (213) 886-9200

#### **EMAKO 22** MICROPRINTER

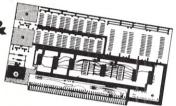
A dependable, low cost addition to your computer system, featuring a 9 x 7 dot matrix character format, bidirectional printing at 125 CPS, and sprocket feed paper mechanism. Line length is selectable at 40, 80, or 132 characters per line. Forms may be loaded from the bottom or rear. Available with parallel or asynchronous serial interfacing. Wt 22 lbs.



Cat No. 2455 2456 Description Parallel Interface RS-232C Serial Interface Price \$834.75 \$894.00

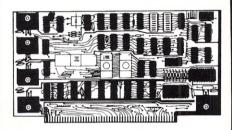
#### SSM OB1 **Vector Jump & Prototyping** Card

Plug compatible for S-100 bus systems, features full 16 bit vector jump address with dip selection of 8080 or Z80. Can be set to jump on Power-on-clear reset, or both Prototyping areas on the card for ten 16-pin IC's, three 24-28 pin IC's, and two spare regulator patterns.



Cat No. 1429 OB1 kIt Cat No. 1430 OB1 A&T Cat No. 1431 OB1 bareboard

#### SSM CB1-A 8080 CPU Board



Just add an I/O board and it's a computer! 256 bytes of on board RAM, with option for 2K of on board PROM. Includes a power-on, preset jump circuit, and MWRITE is available, allowing use without a front panel. There's a parallel input port with status, and AIP controlled addressing: or PROM in 2K blocks increments; RAM in 256 byte increments; input port for addresses 0-31 in

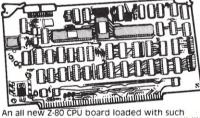
decimal.
Cat No. 1403 CB1-A Kit \$11575 Kit
Cat No. 1441 CB1-A Bareboard \$27.95

#### CCS 32K Static **RAM Board**



Uses 2114 250ns fully Static RAM's Bank selectable in 8K blocks Enable/Disable on power up or Reset. Compatible with North Star, Alpha Micro, Cromeco, etc. Also front panel compatible, addressable in 8K blocks.
Selectable wait state. Wt. 1 lb.
Cat No. 2644 A&T **S649** 

### **Z-80 CPU Board**



great features as S-100/Altair/Imsai compatibility, Power-on jump to any Memory address, selectable Z-80 monitor ROM, selectable MI wait states, full handshake, auto band (2 baud-56K baud) selection, selectable port address, separate baud rate oscillator and on board RS-232 100% disable option serial port. This board also boasts front panel support compatibility, Z-80 NMI capability, phantom line capability, Z-80 interrupt capability and status valid on Data Lines during psnc. Wt. 3 lbs. **\$299** Cat No. 2646

#### CCS 2422 Disk Controller

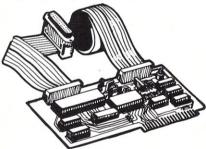
This disk controller is equipped with a soft sector format, will support single and double density formats, and supports up to four 51/4" and/or 8" single or double sided drives. It has ROM controlled addressing for I/O mapped and/or (optional) memory mapped operation, fastseek capability for voice-coil type drive, adjustable write precompensation, digital phase-locked data separator, selectable auto-wait on Data or Control port and on-board 2K Byte Boot/program ROM (2716). A copy of CP/M 2.2 is included \$399 Cat No. 2645

#### 64K Dynamic **RAM Board**

Uses low power 4116 Dynamic RAM's. Bank selectable in 16K blocks, bank Enable/Disable on power-up or reset. "fail safe" modes for transparent refresh on 8080 or Z-80, 4mhz operation, phantom line capability and compatible with front panel 5699

Wt. 12 oz Cat No. 2647 A&T

#### SSM AIO **Apple II Serial &** Parallel Interface



Allows maximum flexibility for interfacing Apple II with peripherals (printers, plotters, terminals, modems, etc.) Communicates with both serial and parallel devices, and can interface with both at the same time. Complete with software and firmware for serial and parallel communications.

#### Features one RS232 serial interface with:

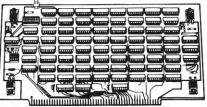
Three handshaking lines (RTS, CTS, DCD); Nine standard baud rates from 110 to 19,200 baud, including 134.5 baud for selectrics; additional baud selectable through external input; baud rates rotary switch selectable, no jumpers required; serial communication modes software

#### Two bi-directional 8-bit parallel ports with:

8-bit parallel ports with:
Four additional interrupt and handshaking lines;
interface configuration software controlled.
Includes on-board firmware for controlling serial
interface and software for driving parallel
printers. Firmware for parallel interface control
optional, Serial and parallel interface cable
assemblies included. Includes comprehensive
manual and application notes.

19511 BUSINESS CTR. DR. DEPT K10 NORTHRIDGE, CA. 91324

#### SSM MB6B **8K Static RAM Board**



8K bytes by 8 bits, fully buffered, compatible with 8080, 8085 and Z80. Dip switch addressing of independent 4K halves lets the MB6B think like two 4K boards, or one 8K board. Independent 4K addressing allows the flexibility to meet varying software memory needs. Uses low power 21L02 RAM's, operates at 2 or 4MHZ, and is compatible with direct memory access controllers.

Cat No.	Description	Price
*1400-A	450ns kit	\$131.75
*1400-B	250ns kit	\$143.95
1401-A	450ns A&T	\$182.50
1401-B	250ns A&T	\$195.00
*1402	Bareboard	\$ 22.50

#### **PROGRAMMA** Data Base Management 5

## · Single sided

Cat No

#### 51/4" Diskettes **VERBATIM 525 SERIES**

 Double Density Perfect for commercial and general applications.

Type 525-01 525-10 525-16 Use for TRS-80, etc. North Star, Apple Micropolis, etc. Description Soft sector 10 hole, hard 16 hole, hard

#### **VERBATIM 577 SERIES**

- · Certified twice, 77 tracks
- Single sided, double density Built-in hub protector ring

For critical data applications

Cat No 2330 2331 2332 Description Type 577-01 577-10 577-16 Soft sector 10 hole, hard 16 hole, hard North Star, Apple Micropolis, etc.

An easy method of creating data files and storing them in disk memory for future use. Allows you to store and manipulate data for maximum productivity, and modify or incorporate your own routines. Uses Radio Shack's TRSDOS/BASIC language. Cat No. 2146 \$49<sup>95</sup> TRS-80 L2, 16K

#### TRS-80 and APPLE **16K Memory** Add-on

Everything you need to upgrade your system! Includes 4 pages of illustrated instructions. Complete with RAM's and preprogrammed jumpers. No special tools required! Wt. 4 oz.

Cat No Description
1156
For TRS-80 Keyboard Unit
1156A For TRS-80 Exp. Interface
purchased before 4/1/79
1156C Papie II
1156D Exidy

Section 1156C Apple II
1156D Exidy

\$44<sup>95</sup>

#### **PROGRAMMA** SUPER STARWARS

You have just come out of hyperspace to find you are right in front of a squadron of imperial fighters --- and your only hope for survival is to destroy them before they get you! You will be attacked by 32 fighters as they close in on you....good luck. Cat No. 2130 \$15 95 Apple, 32K Cassette, Integer

#### MICROSOFT TRS-80 Level III BASIC

Loads with SYSTEM command, yet has the power of a hardware modification. Offers easier loading, keyboard debounce, BASIC access to RS232, new commands, and easier, more powerful graphics. Eliminates volumn sensitivity when loading cassettes, shorthand programming commands, and long error messages. Cat No. 1332 TRS-80 L2, 16K, Cassette **\$49** 

The PIE 2.0

(Programma Improved Editor)

An outstanding package with features of the more expensive Word Processing Software, Including: Character/line insert and delete; complete cursor mobility; string search forward and backward; single; conditional, or global search and replace; move and/or copy blocks of text; page scrolling; tabs, margins, paragraphing,

The time to create, edit, and complete a one page document can be decreased by as much as 60%, when comparing this system to an ordinary typewriter. Comes complete with program diskette and detailed documentation in an attractive simulated leather binder

Apple II 32K + Disk (3.2), Integer \$79<sup>95</sup>

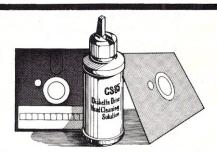
#### **120 DAY OUALITY GUARANTEE**

This guarantee is your assurance of receiving the highest quality products every time you order from HobbyWorld. If you are not satisfied with the quality of the Item you purchased, simply return it to us. All returns must be accompanied by a copy of the sales receipt, and a brief explanation of the reason for return is requested. Guarantee does not include damage to kits from poor assembly practices. Refunds or replacements are at our option. software and books will be replaced with another copy only. HobbyWorld is not responsible for typographical errors.

### (R)CTRONICS,

Call Toll-Free: USA (800) 423-5387 In California: (800) 382-3651

Local & Outside USA: (213) 886-9200



#### **Disk/Diskette Drive** Head Cleaning Kit

Diskette drive heads require periodic maintenance to assure efficient and error-free operation. Unlike other peripheral devices, the read/write heads on disk drives are extremely difficult to clean without partially disassembling the unit. But now, with HobbyWorld's disk drive head cleaning kit, the user can clean these hardto-reach heads in just minutes! Available for both 51/4" and 8" drives, single and double sided. Comes complete with two cleaning disks, 4 oz. of CS-85 cleaning solution, and easy-pour dispenser. Wt 12 07

Cat No. 2499 8" Disk Cat No. 2534 51/4" Diskette

#### SEND FOR FREE FLYER, FEATURING...

Page after page of impressive state-of-the-art products. Included are computers, terminals, disk-drives, printers and many more peripherals that can add dimension to your personal computing. We also stock computerized games and toys, application boards, a large selection of comprehensive software, electronics parts, integrated circuits, P.C. & soldering accessories and much, much more.....

#### **HOW TO ORDER**

Minimum Order \$15.00. Order by phone, mail, or at our retail stores. Pay by check, Mastercharge, Visa or C.O.D. Please include expiration date with charge card orders. U.S. \$\$ only. Include phone number and magazine issue you are ordering from. Add \$1.25 for C.O.D. and shipping charges from rates below.

Shipping Rates: U.S.A.
Cround: Add \$2.25 for first 2 lbs. and 40¢ each addt\*1 lb.

Air: Add \$3.25 for first 2 lbs. and 70¢ each addt\*1 lb.

Shipping Rates: Foreign

addt'i lb.

Shipping Rates: Foreign

Ground: Add \$3.00 first 2 lbs. and 60¢ each addt'i lb.

Alr: Add \$11.25 for first 2 lbs. and \$5.00 each addt'i lb.

Prices Valid through month of Issue.

Not responsible for typographical errors. Some items subject to prior sale or quantity limits. 120 Day Guaranteed Satisfaction.

Exception: Partially assembled kits, abuse or misuse.

19511 BUSINESS CTR. DR. DEPT K10 NORTHRIDGE, CA. 91324

### Power Supplies! Power Supplies! Power Supplies!

SOLID STATE!! (5)

### We got 'em! Take your pick . . .

These units are ideal for micro computers. They have been removed from equipment, checked out and quaranteed.

1-5 volts @ 8 amps + 12 volts @ 2 amps + 6 volts @ 75 MA. Power supply has a 3-wire line cord and	fused. Dimensions:
101/2" × 51/2" × 41/2". Shipping weight: 16 lbs.	37.50 ea. 2/70.0

4-Elexon, multi output, Input: 120/240 AC, ±10%, 47-63 hz; output: 1) 12V, 1.5A, DC, OVP; 2) 12V, 

5-Power Design, Model 1210, constant voltage, DC. P.S. input: 105-125 A.C., 55 to 440 hz. Output: 1-12 volts, 0-10 amps, DC. continuously adjustable output voltage and current limiting. . . . . . 139.00

### COMPUTER GRADE CAPACITORS . . .

18.000 mfd 10 VDC	1.25	11.000 mfd 25 VDC	1.50	4,000 mfd 75 VDC	1.75
4,400 mfd 20 VDC	1.00	35,000 mfd 35 VDC		1,000 mfd 100 VDC	1.00
46,000 mfd 20 VDC	2.50	10,000 mfd 50 VDC	2.50	6,800 mfd 100 VDC	3.50
3.000 mfd 25 VDC	1.00	22,000 mfd 60 VDC	3.75	4,700 mfd 150 VDC	3.75

### WIRE WRAP BOARDS

These boards are pre-wired and removed from equipment. Easy to unwrap for setting up your own board, contains mostly 14-pin IC sockets with individual pin connections. Each board has VCC and ground planes.

Smaller board measures 61/2" x 6" and has 40 to 50 sockets. Larger board measures 131/2" × 6" and has 75 to 100 sockets.





Reduced prices

\$7.50 ea. 2/\$14.00 \$12.50 ea. 2/\$23.00

### DIABLO System Disc Drive

SERIES 40, MODEL 43

100 tracks per inch, total capacity of 50 megabits, w/Model 429 power supply, sector counter, 24 sectors, 1 fixed disc, 1 removable disc, average access time 38 ms, PPM: 2600, dimensions: 10 5/16" high, fits in standard rack, equipped with full extension slides, excellent used condition. Shipped freight collect.



\$2495

HEWLETT PACKARD model 200CD/rack mounted AUDIO OSCILLATOR freq:5hz to 600khz output: 160mw

**HEWLETT PACKARD model 400D** ANALOG VACUUM TUBE VOLTMETER freg: 10hz to 4mhz voltmeter range: 1mv to 300vac in 12 ranges \$85.00

**ISOLATION STEP-DOWN TYPE** 

Primary: 230/115V, 50/60 CPS, Secondary: 115 volts output 250 VA.

\$13.95

**EACH** 

#### **IMC MAGNETICS** SUPER BOXER FANS

Unused, Model WS2107FL -310, 220/240 VAC, .3 amps, 50/60 hz, 4 11/16" × 4 11/16" × 1 1/2"

\$8.95

Clock Crystal Oscillators-TTL, Vectron, type CO-231T. Crystal freq. 4.9152 mhz. Input voltage 5 VDC ±. Output: Drives 10 TTL Loads Logic "0": 0.4V max., sink 16ma. Logic "1" 2.4V min source 2 ma. (above 50 mhz drives 2 Schottky TTL loads). Tuning adjust, with nominal range of ±30 ppm below 25 mhz and 15 ppm above 25 mhz. R.F.E. 11/2" x 11/2" × 1/2".....\$13.95

#### SG-132 SWEEP SIGNAL GENE OR

FREQ: 15 TO 400 MUZ Output: AM & FM: CW 511 o at any fre-..., 5mhz or ± 10B. Frequency. Crystal oscilloscope for observing quency act waveforms.

\$329

#### TRENDLINE PHONES

Manufactured by I.T.T.

These units have rotary dials. Colors are: white, black, red, and green. They are packaged and have 6-foot cord and installation instructions. Used, but in good operating condition.

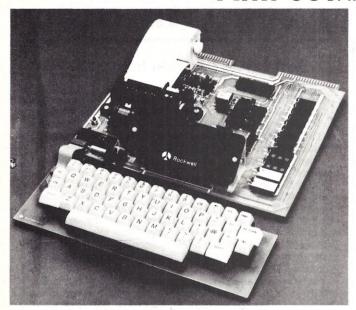
**34.50** WALL TYPE

Minimum order \$25.00. Items offered subject to prior sale. FOB, Brockton, Mass. Money order or check w/order. Shipments and handling add 5%. Shipments by parcel post or UPS. No CODs. Mass. residents add 5% sales tax.

ELECTRONICS CO. INC. Tel: (617) 588-6440-6441 ∠45 108 SAWTELL AVE., BROCKTON, MA. 02402

FLECTRONIC COMPONENTS **TEST EQUIPMENT** CONNECTORS—WIRE

### AIM 65 BY ROCKWELL INTERNATIONAL



AIM 65 is fully assembled, tested and warranted. With the addition of a low cost, readily available power supply, it's ready to start working for you.

AIM 65 features on-board thermal printer and alphanumeric display, and a terminal-style keyboard. It has an addressing capability up to 65K bytes, and comes with a user-dedicated 1K or 4K RAM. Two installed 4K ROMS hold a powerful Advanced Interface Monitor program, and three spare sockets are included to expand on-board ROM or PROM up to 20K bytes.

An Application Connector provides for attaching a TTY and one or two audio cassette recorders, and gives external access to the user-dedicated general purpose I/O lines.

Also included as standard are a comprehensive AIM 65 User's Manual, a handy pocket reference card, an R6500 Hardware Manual, an R6500 Programming Manual and an AIM 65 schematic.

AIM 65 is packaged on two compact modules. The circuit module is 12 inches wide and 10 inches long, the keyboard module is 12 inches wide and 4 inches long. They are connected by a detachable cable.

#### THERMAL PRINTER

Most desired feature on low-cost microcomputer systems . . .

- Wide 20-column printout
- Versatile 5 x 7 dot matrix format
- · Complete 64-character ASCII alphanumeric format
- · Fast 120 lines per minute
- · Quite thermal operation
- Proven reliability

#### **FULL-SIZE ALPHANUMERIC KEYBOARD**

Provides compatibility with system terminals . . .

- Standard 54 key, terminal-style layout
- 26 alphabetic characters
- 10 numeric characters
- · 22 special characters
- 9 control functions
- 3 user-defined functions

#### TRUE ALPHANUMERIC DISPLAY

Provides legible and lengthy display . . .

- · 20 characters wide
- 16-segment characters
- · High contrast monolithic characters
- Complete 64-character ASCII alphanumeric format

### PROVEN R6500 MICROCOMPUTER SYSTEM DEVICES Reliable, high performance NMOS technology . . .

- R6502 Central Processing Unit (CPU), operating at 1 MHz. Has 65K address capability, 13 addressing modes and true index capability. Simple but powerful 56 instructions.
- Read/Write Memory, using R2114 Static RAM devices.
   Available in 1K byte and 4K byte versions.
- 8K Monitor Program Memory, using R2332 Static ROM devices. Has sockets to accept additional 2332 ROM or 2532 PROM devices, to expand on-board Program memory up to 20K bytes.
- R6532 RAM-Input/Output-Timer (RIOT) combination device. Multipurpose circuit for AIM 65 Monitor functions.
- Two R6522 Versatile Interface Adapter (VIA) devices, which support AIM 65 and user functions. Each VIA has two parallel and one serial 8-bit, bidirectional I/O ports, two 2-bit peripheral handshake control lines and two fully-programmable 16-bit interval timer/event counters.

#### **BUILT-IN EXPANSION CAPABILITY**

- 44-Pin Application Connector for peripheral add-ons
- · 44-Pin Expansion Connector has full system bus
- · Both connectors are KIM-1 compatible

#### TTY AND AUDIO CASSETTE INTERFACES

Standard interface to low-cost peripherals . . .

- 20 ma. current loop TTY interface
- Interface for two audio cassette recorders
- Two audio cassette formats: ASCII KIM-1 compatible and binary, blocked file assembler compatible

#### **ROM RESIDENT ADVANCED INTERACTIVE MONITOR**

Advanced features found only on larger systems . . .

- · Monitor-generated prompts
- Single keystroke commandsAddress independent data entry
- Debug aids
- Error messages
- Option and user interface linkage

#### ADVANCED INTERACTIVE MONITOR COMMANDS

- Major Function Entry
- Instruction Entry and Disassembly
- Display/Alter Registers and Memory
- Manipulate Breakpoints
- Control Instruction/Trace
- Control Peripheral Devices
- Call User-Defined Functions
- Comprehensive Text Editor

#### LOW COST PLUG-IN ROM OPTIONS

- 4K Assembler—symbolic, two-pass , A65-010 \$79.00
- 8K BASIC Interpreter

#### A65-020 \$99.00

- POWER SUPPLY SPECIFICATIONS

  + 5 VDC ± 5% regulated @ 2.0 amps (max)
- +24 VDC ±15% unregulated @ 2.5 amps (peak)
   0.5 amps average

#### PRICE: \$389.00 (1K RAM) \$439.00 (4K RAM)

Plus \$4.00 UPS (shipped in U.S. must give street address), \$10 parcel post to APO's, FPO's, Alaska, Hawaii, Canada, \$25 air mail to all other countries AIM 65 USER MANUAL \$5.00 plus \$1.50 shipping & handling.

We manufacture a complete line of high quality expansion boards. Use reader service card to be added to our mailing list, or U.S. residents send \$1.00 (International send \$3.00 U.S.) for airmail delivery of our complete catalog.

We've Expanded Again! Note our new address.

2951 W. Fairmount Avenue Phoenix AZ 85017

(602)265-7564







### New Releases for the TRS-80

#### Mail/List from Galactic Software Ltd. A Mailing List for the TRS-80 Model I or Model II

Instant Software always tries to provide you with the best software on the market. Although the Mail/File mailing list program is not published by us, it is so good that we want you to try it.

We have two versions of this mailing list. Pkg. 5000RD is for the Model I with the 5-inch disk drive and Pkg. 5001RD is for the Model II with the 8-inch disk drive. The programs are essentially identical except for the storage media and their respective capacities.

With the 5-inch drive, you can store up to 600 names per disk without DOS, or 300 names per disk with DOS. With the 8-inch drive, you can store up to 2500 names per disk, with or without DOS. (If your list is larger than the single disk maximum, it can be distributed over several disks.)

The program maintains separate alphabetical and ZIP code files under constant sort. When you add a name to your list it will be inserted into its correct position in the files. You will never have to sort your list, it will always be ready to print labels.

The program will record your data in nine fields: two for NAME, and one each for ADDRESS, CITY, STATE, ZIP CODE, PHONE NUMBER, PHONE EXTENSION, and a five character CODE field. When you print labels, you have a choice of three different label formats: a three line label, a four line label or a user-defined label. In the three line and user-defined label formats, you may include a message line on your label.

The best feature of this program is the sort process that lets you determine which labels will be printed. You may specify either alphabetical or ZIP code order for all or any part of your list. For example, you can print labels for everyone on your list whose name begins with the letter A, or for all of those people who have the same ZIP code. You can even print labels for only those people named Jones, who are living in a given city or state. (Note: The Model II version can search for both first and last names, e.g., John Jones.) Furthermore, you can choose to print labels by using any single field (i.e., specific cities, states, phone numbers, etc.). You may assign specific codes to any name in the CODE field. For example, ACT could stand for active accounts, and INACT for inactive accounts. If you wanted to send a letter to all of your inactive accounts, you would specify the CODE INACT, and labels would be printed only for your inactive accounts. When you print labels, you may specify up to nine different CODES at one time. If your data matches any one of the CODES, a label will be printed.

Files created with the Model I version of this program can be transferred to the Model II version, when you upgrade your

Package 5000RD requires the following minimum system:

- 1. A TRS-80 Model I Level II with 16K RAM.
- 2. An Expansion Interface with 16K RAM (or more).
- One (or more) mini-disk drives.
- 4. A compatible printer (80 or 132 columns).
- 5. TRSDOS version 2.3.

Order No. 5000RD (Model I version) \$99.00

Package 5001RD requires the following minimum system:

- 1. A TRS-80 Model II with 64K of RAM.
- 2. Additional Expansion Unit drives (optional).
- Model II TRSDOS version 1.2.
- 4. A compatible printer (80 or 132 column).

Order No. 5001RD (Model II version) \$199.00.

#### **Basic Math Program from EMSI**

Although we do not publish this package, it is so outstanding that we would be remiss if we didn't offer it to you, our customers. The Basic Math Program is a comprehensive math teaching package divided into six sections. It is, also, the best educational software that we have seen for teaching arithmetic skills. The package was designed and created by a certified math teacher with 15 years of programming ex-

The first three programs in the package comprise: Whole Number Arithmetic by Teaching Objective. This set includes lessons in Addition, Subtraction and Multiplication. (Whole Number Division by Teaching Objective will be available soon.) The fourth program is Fractions and Mixed Number Arithmetic. Logic and Deductive Reasoning is the fifth program in the set. The Metric-English Conversion program rounds out the series.

You, the teacher, can choose a variety of options from the MENU, so as to custom-tailor both practice and test sessions. The program options include: Number of problems/session, Level of problem difficulty, Number of seconds per problem, Type of assistance to be offered (digit by digit or retry), Type of reward, as well as options specific to the Addition and the Subtraction sections.

This package includes an excellent, 60 page Teacher's Manual that explains how to use all program features even for those people who have no prior experience with a computer system. The manual introduces and explains all of the teaching objectives in terms of the specific skills to be mastered. It contains detailed instructions on how to use the computer. (It even explains the proper cassette loading procedure in easily understood terms.) The manual goes on to show you exactly what material will appear on the computer screen, and how to select the program options. It explains how to use the Analysis of Session Results feature, which shows not only the number of problems/number correct, but displays the actual problems given, notes if an incorrect digit was entered, whether it was corrected during the session and whether the student used the HELP feature.

The Fractions and Mixed Number Arithmetic program shows the student every step of how to solve these problems. It waits for the student to enter each answer and - if he/she has made an error - provides a review of the process, so that the error can be found. It can also be run as a "fraction/mixed number calculator".

The Deductive Reasoning program is a modified and much improved Mastermind-type exercise. It may be played as a game, or used to exemplify the rigorous nature of valid inference.

The Metric/English Conversion program will convert quantities (length, area, volume and weight) from Metric to English, or English to Metric. It includes all of the most commonly used units of measure.

First there was the revolution of Computer Assisted Instruction. Now, there's the evolution of this extraordinary "teacher's aide'

Order No. 5002R \$80.00

TO ORDER: Look for these programs at the dealer nearest you (see list of dealers on page 205). If your store doesn't stock Instant Software send your order with payment to: Instant Software, Order Dept., Peterborough, N.H. 03458 (Add \$1.00 for handling) or call toll-free 1-800-258-5473 (VISA, MC and AE accepted).

\*A trademark of Tandy Corporation

## nstant Software PETERBOROUGH, N.H. 03458 603-924-7296

### New Releases for the TRS-80 -Utilities-

We're proud to present three disassemblers for the TRS-80. For speed and simplicity, we recommend The Disassembler. For complex disassemblies, especially if you wish to make alterations, you may prefer one of our Labeling Disassemblers, either TLDIS or DLDIS.

#### **TLDIS & DLDIS**

You've bought a super machine-code program, but now wonder how it works. Maybe you even used a quick PEEK routine to glance through it when it was in memory. If so, you definitely noticed the complete lack of comments in the code, making it almost impossible for you to decipher and understand it.

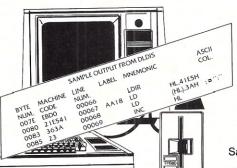
Well, Instant Software's Labeling Disassemblers are the answer to your problem.

TLDIS (Tape-based Labeling DISassembler) and DLDIS (Disk-based Labeling DISassembler) are three-pass, labelassigning disassemblers which assign labels (where appropriate) to the routines in a machine-language program. Their output is almost identical to that of a hand-assembled source code.

You can send the disassembly to a lineprinter (Radio Shack parallel port) for either TLDIS or DLDIS. (The difference between these utilities is the storage mode of the disassembly.)

TLDIS can send the disassembly to cassette tape, DLDIS can send it to disk; both send it to the video monitor. The stored disassembly from TLDIS may be reassembled with Radio Shack's EDTASM(TM) - the disassembly from DLDIS, with Apparat's extension of ED-TASM(TM)

Because of the use of labels, it is a simple matter to change any object code program by disassembling it and then



making changes to the resultant source code, without losing track of jump/load addresses. Labels start with "AA00" and increment up, in even numbered steps (AA02, AA04, etc.). The odd numbers (AA01, AA03, etc.) are left for you to use for the source code during reassembly.

The printing of the disassembly may be temporarily halted by using [SHIFT] @ (just as in BASIC) or it may be ended by pressing the [BREAK] key. It also has a comments column to display ASCII charachters used in a LD or CP opcode.

Because TLDIS and DLDIS work only on in-memory programs, they may be relocated in memory to avoid conflict with the program you disassemble.

The next time you need to "climb inside" a machine-code program, take DLDIS or TLDIS with you. We promise that it will be an easier journey.

Order No. 0230R (TLDIS) \$14.95 Order No. 0231RD (DLDIS) \$19.95

#### The Disassembler

This is a single-pass, hex-notation disassembler that will send its output either to tape or to a lineprinter (Radio Shack parallel port). The tape output is directly compatible with Tandy's ED-TASM(TM). Thus, you can take an object code tape, disassemble and output it to tape, then use EDTASM(TM) to add, delete, change and even re-assemble your new version.

In addition, it displays the displacement and absolute address of any relative jumps made by the disassembled program. It also displays any ASCII characters used in a LD or CP opcode.

#### Sample output from the Disassembler

BYTE	MACHINE	LINE	MNEMONIC	COMMENTS	
NUM.	CODE	NUM.		COLUMN	
706E	22057B	00053	LD	(7B05H),HL	
7071	183B	00054	JR	\$ + 3DH	;70AEH
7073	FE52	00055	CP	52H	;="R"
7075	2007	00056	JR	NZ,\$ + 09H	;707EH
7077	CD8F70	00057	CALL	708FH	

H means the number is HEX \$ means current location counter.

Since the Disassembler works only on in-memory programs, it has been made relocatable so that you may move it around in memory to avoid conflict with the program you wish to disassemble. As an added option, you may also jump to memory locations and transfer control between Disassembler and other utility programs in your computer.

The Disassembler, use it to examine and analyze any machine-code program!

Order No. 0232R \$9.95

#### Terminal-80

The Terminal-80 package lets your TRS-80 communicate with the rest of the world. These programs give you control of the RS-232 port of your Expansion In-

You can connect one or more serial terminals to your TRS-80. Your computer will accept input from the RS-232 port just as if it were entered from the keyboard. Thus, you can use your computer from a remote terminal without having to move your equipment.

The TRS-80 can also be transformed into a "dumb" terminal. You can use it in a time-sharing situation to talk to "big" computers via a modem. All data that you type in will go out through the RS-232 port and all incoming data will be displayed on the screen.

You can transfer programs over the phone lines. Just load a program into the TRS-80. The LPRINT/LLIST command will transfer the program to a receiving computer via the RS-232 port.

Using the upper/lowercase modification of the TRS-80 is simplified. (You must have the modification kit installed first or follow the detailed instructions included in this package.) Control characters in Level II and Disk BASIC will be properly displayed and all functions such as CHR\$ will work correctly.

This package even includes a BASIC program to set the baud rate. You won't have to tear apart your Expansion Interface if you use more than one configura-

There are thousands of TRS-80 computers in the world. Let's get together and talk to each other-with the Terminal-80 from Instant Software.

This package requires the following minimum system:

- 1. A TRS-80 with 16K of memory.
- 2. An Expansion Interface.
- 3. An RS-232 Serial Interface (e.g., Radio Shack's No. 26-1145 or the equivalent).
- 4. An optional upper/lowercase modification kit.

Order No.0130R (cassette-based) \$24.95.

WRITE FOR OUR NEW CATALOG!

## Stant Software Peterborough, N.H. 03458

603-924-7296

### **WAMECO**

### THE COMPLETE PC BOARD HOUSE EVERYTHING FOR THE S-100 BUSS

* FPB-1 FRONT PANEL BOARD FOR 8080A AND Z80 SYSTEMS IMSAI COMPATIBLE. PCBD \$56.95 KIT \$175.00	* QMB-12 13 SLOT MOTHER BOARD. PCBD \$42.95 KIT \$125.95
* MEM-2 16K RAM 2114's, ADDRESSABLE IN 4K BOUNDARIES.	<b>* QMB-9</b> 9 SLOT MOTHER BOARD. PCBD \$35.95 KIT \$109.95
PCBD \$33.95 KIT (LESS RAMS) \$80.95	* PTB-1 POWER SUPPLY AND TERMINATOR BOARD. PCBD \$29.95 KIT \$49.95
* EPM-2 16/32K ROM USES 2716 OR 2708. ADDRESS-ABLE IN 4K BOUNDARIES. PCBD \$33.95 KIT (LESS ROMS) \$74.95	* RTC-1 REAL TIME CLOCK BOARD WITH TWO INTERRUPTS. PCBD \$29.95 KIT \$79.95
* CPU-1 8080A PROCESSOR BOARD WITH VECTOR INTERRUPT. PCBD \$33.95 KIT \$124.95	* MEM-1 8K RAM, USES 2102's. PCBD \$33.95 KIT (LESS RAM) \$71.95
* IOB-1 I/O BOARD. ONE SERIAL, TWO PARALLEL WITH CASSETTE. PCBD \$33.95	* EPM-1 4K 170Z BOARD. PCBD \$29.95 KIT (LESS ROM) \$59.95
* FDC-1 FLOPPY DISC CONTROLLER BOARD USES 1771. PCBD \$45.95	

FUTURE PRODUCTS: 80 CHARACTER VIDEO BOARD. Z-80 CPU BOARD WITH ROM, 8 PARALLEL PORT I/O BOARD

### DEALER INQUIRIES INVITED, UNIVERSITY DISCOUNTS AVAILABLE AT YOUR LOCAL DEALER

MOST PRODUCTS FOR IMMEDIATE SHIPMENT. NO 4-8 WEEK DELAYS REQUIRED FOR OTHERS.



WAMECO, INC., P.O. BOX 877 • 455 PLAZA ALHAMBRA • EL GRANADA, CA 94018 • (415) 726-6378



#### WMC/inc. WAMECO INC. FDC-1 FLOPPY CONTROLLER BOARD will drive shugart, pertek, remic 5" & 8" drives up to 8 drives, on board PROM with power boot up, will operate with CPM™ (not included). PCBD .....\$43.95 FPB-1 Front Panel. IMSAI size, hex displays. Byte, or instruction single step. PCBD ......\$48.50 MEM-1A 8K x 8 fully buffered, S-100, uses 2102 type rams, PCBD ......\$28.95 QM-12 MOTHER BOARD, 13 slot, terminated, S-100 board only ......\$39.95 CPU-1 8080A Processor board S-100 with 8 level vector interrupt. PCBD ......\$28.95 RTC-1 Realtime clock board. Two independent interrupts. Software programmable. PCBD.......\$25.95 EPM-1 1702A 4K Eprom card. PCBD ......\$25.95 EPM-2 2708/2716 16K/32K EPROM CARD. PCBD .... QM-9 MOTHER BOARD. Short Version of QM-12. 9 Slots, PCBD ......\$33.95 MEM-2 16K x 8 Fully Buffered 2114 Board. PCBD .....\$28.95 PTB-1 POWER SUPPLY AND TERMINATOR BOARD. PCRD ...\$28.95 IOB-1 SERIAL AND PARALLEL INTERFACE. 2 parallel, one serial and cassette. PCBD .... \$28.95

## MIKOS

\$35.95

.\$ 9.49 2114L 450 NSEC ...... \$5.99

\$6.99

2114L 200 NSEC

2708

2716

(415) 726-7593
P. O. Box 955 • El Granada, CA 94018
Please send for IC, Xistor and Computer parts list

### OCT. SPECIAL SALE ON PREPAID ORDERS

RAM SALE	
MEM-2, PCBD	\$25.95
MEM-2 + PARTS LESS RAM	\$49.95
MEM-2 MIKOS #7 450 NSEC.	\$199.95

# MIKOS PARTS ASSORTMENT WITH WAMECO AND CYBERCOM PCBDS MEM-2 with MIKOS #7 16K ram with L2114 450 NSEC \$229.95 MEM-2 with MIKOS #13 16K ram with L2114 200 NSEC \$249.95 CPU-1 with MIKOS #2 8080A CPU \$99.95 QM-12 with MIKOS #4 13 slot mother board \$110.95

 QM-12 with MIKOS #4 13 slot mother board
 \$110.95

 RTC-1 with MIKOS #5 real time clock.
 \$65.95

 EMP-1 with MIKOS #10 4K 1702 less
 EPROMS

 EPROMS
 \$49.95

 EPM-2 with MIKOS #11 16-32K EPROMS

 less EPROMS
 \$65.95

 QM-9 with MIKOS #12 9 slot mother

 board
 \$99.95

 FPB-1 with MIKOS #14 all parts

 for front panel
 \$144.95

 MIKOS PARTS ASSORTMENTS ARE ALL FACTORY MARKED PARTS. KITS INCLUDE ALL PARTS LISTED AS REQUIRED FOR THE COMPLETE KIT LESS PARTS LISTED. ALL SOCK-ETS INCLUDEO.

LARGE SELECTION OF LS TTL AVAILABLE
PURCHASE \$50.00 WORTH OF LS TTL AND GET
10% CREDIT TOWARD ADDITIONAL PURCHASES.
PREPAID ORDERS ONLY.

VISA or MASTERCHARGE. Send account number, interbank number, expiration date and sign your order. Approx. postage will be added. Check or money order will be sent post paid in U.S. If you are not a regular customer, please use charge, cashier's check or postal money order. Otherwise there will be a two-week delay for checks to clear. Calif. residents add 6% tax. Money back 30-day guarantee. We cannot accept returned IC's that have been soldered to. Prices subject to change without notice. \$10 minimum order. \$1.50 service charge on orders less than \$10.00.

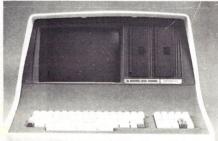
ALL OTHER SSM PRODUCTS AVAILABLE

## Computers, Disk Systems

INTERSYSTEMS

formerly ITHACA AUDIO

#### SUPERBRAIN® By INTERTEC



32K or 64K (Double or Quad Density units available). Uses two Z-80 CPU's. Commercial-type terminal with 12" monitor. Dual double density minifloppies. Over 350 kilobytes of storage (twice that with quad density drives). Two serial RS232 ports, I/O ports standard. Expandable with optional S-100 S-100 interface. Comes with CP/MTM 2.2 operating system. MiniMicroMart includes BASIC interpreter and can supply a wide range of CP/M Development and Application software.

w/32K Double Density, List \$2995 . \$2	685
w/64K Double Density, List \$3345	
w/64K Quad Density, List \$3995	\$3595
W/64K Quad — MiniMicroMart	\$3395

#### **MICROMATION**



A 64K complete computer with dual density 8" floppies (1 megabyte). Rack or vertical mounting. Systems with double-sided drives, hard disks, and multi-user (MP/M).

Z+ 100 64K RAM, Computer, \$2495. . \$2099 Z+ 120 Includes two 8" disks, \$4995. . . \$4199

"Z" system features new distributed processing multi-user concept with one Z-80 per user, with Z-80 for MP/M (Master Satellite concept).

AS LOW AS \$11,899!

#### **SD SYSTEMS**

SDS-100,	w/32K RAM,	\$6995	\$5945
SDS-200,	List \$8995		\$7645



# DPS-1, List \$1795 LIMITED TIME \$1299\* The new Series II CPU Board features a 4 MHz Z-80A CPU and a full-feature front panel. 20-slot actively terminated motherboard, with 25

slot actively terminated motherboard, with 25 amp power supply (50/60 Hz operation, incl. 68 cfm fan).

COMPLETE SYSTEM with InterSystem 64K

RAM, I/O Board w/priority interrupt and double density disk controller board. Full 1-year warranty, List \$3595

#### **LIMITED TIME \$2895\***

Above without disk controller, List \$3195 . . . . LIMITED TIME \$2539\* \* Prices good until September 15, 1980.

### HEWLETT-PACKARD HP-85A

Desk-top computer - Call for Price!



## MORROW THINKER TOYS® DISCUS M26TM

26 megabytes of formatted storage List \$4,995

\$4,199



#### THINKER TOYS® DISK SYSTEMS

Now includes CP/M® 2.2
Discus 2D, List \$1199.....\$1019
Discus 2D, dual-drive, List \$1994.....\$1694
Discus 2+2, Assem., List \$1549.....\$1319
Dual Discus 2+2, Assem., \$2748....\$2335
All Morrow systems now include CP/M® 2.2

## NORTH STAR DOUBLE DENSITY CONTROLLER BOARDS

Kit, List \$399

**OUR PRICE \$329** 

Assembled and Tested, List \$499.....\$399

In Stock — First Time in 2 Years!

#### FANTASTIC SAVINGS on a "QUAD" DENSITY HORIZON UPGRADE

North Star Double Density Controller Board (see above) and a quad density MPI-52 (features superior disk handling and door mechanism.

MDS-H-MQ/K Kit form
List \$999 OUR PRICE \$699

MDS-H-MQ/A Assembled form, List \$1099

Shipping and insurance: Add \$6.

#### NORTH STAR MDS-A Double Density Mini Floppy Disk System

Double Density, Kit
List \$799

OUR PRICE \$669

Assembled and Tested......\$719

Quad Version, Kit, List.....\$836

Assembled, List \$1099.....\$896

Above MDS-A units do not include cabinet or power supply.

Shipping and Insurance: Add \$7.50.

#### Super Special!

## North Star Controller Board, Drive, Cabinet, and Power Supply \$709

Complete system similar to above but also includes a cabinet and an assembled/tested power supply for the drive (silver finish). Your choice of Shugart SA-400 or MPI-51 Double Density Drive or MPI-52 quad density drive (MPI drives feature improved door and disk handling mechanism).

w/Controller Bd. kit, SA-400\$70	9
w/Controller Bd. kit, MPI-51\$70	
w/Controller Bd. kit, MPI-52\$80	)9
w/Assembled Bd. and SA-400\$76	9
w/Assembled Bd. and MPI-51, \$76	9
w/Assembled Bd. and MPI-52\$86	9
01: 1 11 1110	

Shipping and Insurance: Add \$6.
For converting existing Horizon 2 to quad,

Turn Page

## Terminals and Printers!

#### **TELEVIDEO TVI-912C**



Upper and lower case, 15 baud rates: 75 to 19,000 baud, dual intensity, 24 x 80 character display, 12 x 10 resolution. Numeric pad. Programmable reversible video, auxiliary port, self-test mode, protect mode, block mode, tabbing, addressable cursor. Microprocessor controlled, programmable underline, line and character insert/delete. "C" version features typewriter-style keyboard. List \$950

#### OUR PRICE \$789

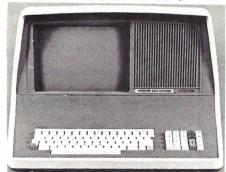
920C (with 11 function keys, 6 edit keys and 2 transmission mode keys, List \$1030

**ONLY \$849** 

#### Intertec **EMULATOR**

Software compatible with a Soroc IQ-120, Hazeltine 1500, ADM-3A or DEC VT-52. Features block mode transmission and printer port; 12" anti-glare screen; 18-key numeric keypad; full cursor control. List \$895

**OUR PRICE \$729** 



### Intertec INTERTUBE II

List \$995 ONLY \$799 12" display, 24 x 80 format, 18-key numeric keypad, 128 upper/lower case ASCII charac-

ters. Reverse video, blinking, complete cursor addressing and control. Special user-defined control function keys, protected and unprotected fields. Line insert/delete and character insert/delete editing, eleven special line drawing symbols.

#### SOROC



#### HAZELTINE



1410 w/numeric keypad, List \$900 \$749 1420 w/lower case and numeric pad 849	
1510, List \$1395	)

#### **BANTAM 550**

From Perkin-Elmer



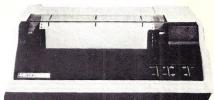
ONLY \$799 with anti-glare

CRT

### CENTRONICS

NEW 730, parallel, friction, tractor	\$679
NEW 737 parallel, friction, tractor	\$849
779-2 w/tractor (same as TRS-80 Line	
Printer I), List \$1350	1049
702 120 cps, bi-direct., tractor, VFU	
703 185 cps, bi-direct., tractor, VFU	
704 RS232 serial version of 703, \$2350.	. \$1995

#### TI-810



TI-810 Basic Unit, \$1895 . ONLY \$1695 TI-810 w/full ASCII (Lower case), vertical forms control, and compressed print . \$1895

TI-745 Complete printing terminal with acoustic coupler, List \$1695 . . . \$1399

#### PAPER TIGER





IDS-440 Paper Tiger, List \$995 . \$895 w/graphics option, incl. buffer, \$1194 . . \$989 



Terminal/Keyboard as well as RO Printer Only models available.

**CALL FOR PRICES!** 

OKIDATA Microline 80		
Tractor Feed Option Serial interface		
AXIOM IMP I .		. \$699
COMPRINT 912 w/pa 912 w/serial interface, List	rallel interf t \$699	. \$559 \$589
MICROTEK, List \$75	0	. \$675
ANADEX 80-Col. Dot N	/latrix	. \$849

Above prices reflect a 2% cash discount (order prepaid prior to shipment). Add 2% to prices for credit card orders, C.O.D.'s, etc. Prices are f.o.b. shipping point. Prices are subject to change and offers subject to withdrawal without notice. WRITE FOR FREE CATALOG.

## MiniMicroMa



1618 James Street, Syracuse NY 13203 (315) 422-4467 TWX 710-541-0431

### MICROCOMPUTING THE LIST OF ADVERTISERS

eau	der Service Number	Page	Rea	der Service Number	Page	Read	ler Service Number	Pa
1	Aardvark Technical Services	110	33	Houston Micro Computer	200	303	Personal Computer Systems	
09	Adventure International		209	IAN Electronics		112	Personal Micro Computers, Inc	
			264			11	Programma International	
	AEI			Industrial Marine Electronics				
7	Allen Ashley		128	Innovative Technology		202	Progressive Computing	
	Alpha Products Company		40	Instant Software15, 21, 166		245	Purser Magazine	
	American Square Computers	71	77	Integrand Research Corp		137	Quant Systems	
6	Anadex, Inc	23	138	Integrated Service Systems, Inc	108	295	Quasar Data Products	
9	Analytical Systems	155	475	Integrated Service Systems, Inc	22	44	Quest Electronics	
	APF Electronics, Inc		235	Interlude		46	R&R Marketing	
	Apparat, Inc		22.5	Intertec Data Systems		485	Racet Computes	
4	Apple-jack		279	Island Cybernetics		101	Racet Computes	
	Archabold Electronics	205	92	J.P.C. Products		482	Radio Shack	
0	Aristo/Polks	146	41	Jameco Electronics	228, 229	*	Radio Shack	
7	Atec Systems	48	180	J.E.S. Graphics	146		Rainbow	
	Audio Video Systems		164	Jini Microsystems		496	Rainbow Computing, Inc	
	Aurora Software		247	Joe Computer		491	Rainbow Computing, Inc	
,								
	Automated Equipment Inc		99	John Bell Engineering		142	Random Access, Inc	
	Automated Simulations		222	Kalglo Electronics	71	117	Realty Software Company	
9	Beta Computer Devices		*	Kilobaud Microcomputing		52	RNB Enterprises	
	CFR Assoc			71, 99, 109, 201, 210	, 215, 216-219	20	Robb Report	
	CMS Software Systems		124	Krell Software		102	Robertson Electronics	
3	CPU Shop		198	LNW Research		74	Rondure Company	
			312					
	C & S Electronics Mart, Ltd					321	SS-50 Computing	
	California Computer Systems		59	Leedex		281	Scelbi Publications	
	Edward Carlson		-	Lifeboat Associates		213	Scitek	
	Checks to go		219	MTI		208	Service Technologies, Inc	
	Cleveland Consumer Computers		207	Macrotronics	130	67	Sirius Systems	
	Compleat Systems		499	Manhattan Software, Inc		132	68 Micro Journal	
	CompuCover		479	Matchless Systems		66	Skyles Electric Works	
			* 10					
	Compumart		400	Mediamix			Slectronics	
	Compuserve		129	Med Systems		231	Small Systems Software	
	CompuSoft Publishing	97	492	Mendocino Software		146	Software Central	
	Computer Corner of NJ		108	Micro Architect		302	Software Dev. & Training Inc	
	Computer Design Labs		488	Micro Architect	24	322	Software Mart	
	Computer Distributors		248	Micro Business World		294	Software Review	
	Computer Information Exchange, Inc		216	The Micro Clinic		229		
						100000000000000000000000000000000000000	The Software Trader	
	Computer Instant Ads, Assoc		167	Micro Computer Industries			Spectrum Software	
	Computer Services		126	Micro Discount Service			The Stocking Source	
	Computer Shopper	195	100	Micro Management Systems	171		Structured Program Designers	
	The Computer Stop		176	Micro Product Unlimited	70		Studio Magnetics Co, Inc	
	The Computer Stop		280	Micro Technical Products			Sun Technology	
	Computer Textile		344	Microcomputer Services Corp		25		
							Tab Books	
	Computers Unlimited		30	Microcomputer Technology Inc	123		Tab Sales Company	
	Computers Wholesale		260	The Microcomputer Warehouse			Tecmar, Inc	
	Computronics		487	MicroDaSys			Telecompute Integrated Systems	
•	Concord Computer Components	230	68	Micromail	177, 179		Texas Computer Systems	
	Condor Computer Corporation		277	Micromint, Inc			Tora Systems Limited	
	Coosol, Inc		253	Micron, Inc			Total Information Services	
			123	Microsette Co				
	Coosol, Inc						Total Information Services	
	Custom Electronics, Inc		86	Mid East Micro			Max Ule Adv. & Mkt	
	Cybernetics, Inc		-	Midwest Scientific Instruments		325	Urban Aggregates, Inc	
	DAR Sales	150	٠	Mikos	238		VR Data Corp	
	Data Analysis Systems		255	Miller Microcomputer Services			Vandata	
	Delta Systems		304	Mini Micro Mart			Wallen Electronics	
			226			40		
	Digital Graphic Systems			Mini Micro Mart			Wameco, Inc	
	Digital Marketing		50	Mini Micro Mart			Wintek Corp	
	Digital Marketing		238	Mini Micro Mart			World Wide Electronics	
	Digital Research Computers		24	Money Disk	190		Word Wizards	
	Digital Research Parts		477	Mountain Computer, Inc			X & Y Enterprises	
	Discount Computer Products		37	Mullen Computer Products		*	Xymec	
			81	Multi Business Computer Systems		400	Zanata Microsysta	
	Dr. Daley		*			493	Zapata Microsystems	
	Duxbury Systems		000	Mumford Micro Systems				
	Dwo Quong Fok Lok Sow		333	Myron Coy				
	Ecosoft	140	*	National Computer Shows	45			
	Ecosoft			Netronics R & D Ltd70, 80	125, 151, 231			
	Educational Software Professionals		291	New England Business Service Inc				
	Eighty Microcomputing		265	New Technologies Co				
			*	NRI Schools				
	Electravalue Industrial		400				ble advantage	an and
	Electrolabs		103	OEM Systems & Components		-1	his advertiser prefers to be contacted	directly.
	Electronic Specialists		130	Olensky Bros. Inc				
	Electronic Systems		498	OK Machine & Tool Corp	20			
	Emtrol Systems, Inc		54	OK Machine & Tool Corp				
	Erickson Communications		27	OK Machine & Tool Corp				
			89	Omega Sales Co				
	Exatron							
	Exatron		140	Omnitek Systems				
-	FMG Corp	63	29	Optimal Technology, Inc				
	Fair Radio Sales		310	Orange Micro				
	G.W. Computers Ltd		329	Orion Software				
	Galactic Software Ltd		106	PAIA				
(	Gimix, Inc	190, 242	240	PCD Systems				
	Gimix, Inc		19	Paccom	155			
	Godbout		246	Pacific Exchanges				
			274	Pacific Exchanges				
	Mark Gordon Computers							
	Mark Gordon Computers		71	Pan American Electronics, A Radio S				
1	Heath Co	CIV		Authorized Sales Center	198			
		445	400	D				
	Heath Co	115	483	Panasonic Company	20			

For further information from our advertisers, please use the Reader Service card located on the last page.



FEATURES:

### WHAT'S COOKING on the FIFTY BUS

#### 32K STATIC RAM BOARDS

Designed for use with:

★ Existing SS50 Systems

. Decoding for 4 Extended Address Lines (allows

DIP-switch to set extended addressing or disable it

· 4 separate 8K blocks, addressable to any 8K

Includes: Chassis, 6800 CPU, 32K RAM BOARD, I/O card

Includes: Chassis, 6809 CPU, 32K RAM BOARD, I/O card

. Battery back-up of the 1K RAM by substituting CMOS parts.

32K 6809 PLUS SYSTEM...

GIMIX or SWTP Dynamic Address Translators.

80 x 24 VIDEO BOARDS — Specify Format (No Added Charge)

· A 9511 or 9512 Arithmetic Processor.

For 50Hz 230V C.V. POWER SUPPLY.

**EXPORT NOTES:** 

· Each 8K block may be individually disabled

memory decoding up to 1 megabyte)

boundary by DIP-switch

32K 6800 SYSTEM

32K 6809 SYSTEM

★ SS50C Extended Address Systems

. Write protect either of two 16K sections

.... Add \$30.00

power RAMS

· Fully Socketed

AND NOW...GIMIX OFFERS YOU A Choice of 6800 or 6809 CPU CARDS You can order your system to fit your needs or select one of the below featured systems.

Add as much memory as you need using GIMIX Static RAM Cards for the utmost in reliability.

Includes: Chassis, 32K RAM BOARD, I/O Card, and features our 6809 PLUS CPU Card with the Time of Day

Clock option with battery back-up installed, as well as the 6840 Timer Package that provides 3 independent

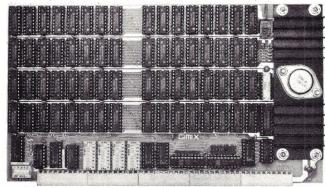
Please contact the factory for further information and availability.

This system also allows the following options to be added at additional cost:

Gold Bus Connectors

· Guaranteed 2MHz operation

• Low power consumption - uses 2114L low



- Assembled
- Burned In
- Tested

16K...\$328.12 24K . . . \$438.14 32K . . . \$548.15

16K and 24K Versions are socketed for 32K and require only additional 2114's for expansion.

\$1.694.59

\$1.844.69

. \$1.994.79

· 25 amp (5V) ferro-resonant constant voltage power supply.

\$898.19

THE CLASSY CHASSIS

- Heavy weight aluminum cabinet with 3 position key switch, fan, and provisions for two 5" disk
- 6800/6809 Mother Board, fifteen 50 pin and eight DIP-switch addressable 30 pin slots (gold plated pins), fully decoded;
- · Baud rate generator on I/O section of Mother Board.

#### I/O BOARDS for the 30 PIN BUS:

1 Port Serial	88.41
2 Port RS 232 Serial	128.43
2 Port Parallel	88.42

8 Port RS 232 Serial	288.40
8 Port RS 232 Serial	318.46
with on board Baud Rate generator.	
8 Port Parallel	198.45

#### BOTH 6809 SYSTEMS **FEATURE OUR NEW TERMINAL BASED** GMXBUG 09 SYSTEM MONITOR

routines.

- \* Can be reconfigured to allow use of other
- ★ Include 1K of Scratchpad RAM on the CPU
- \* Allow optional software switching of system

hecome available

Phone, write, or see your dealer for details and prices on our broad range of Boards and Systems for the SS50/SS50C bus and our AC Power Control Products for all computers.

#### **FACTORY PRIME STATIC RAMS**

2114L 450 ns . . \$5.90 300 ns . . \$6.40 200 ns . . \$6.90 4044 450 ns . . \$5.90 250 ns . . \$6.90

On Orders under \$250.00 for a Single Board, or Chips, please Add \$30.00 Handling and we will ship Air Mail Prepaid.
On all other orders we will ship via Emery Air Freight Collect, and we will charge no handling. All orders must be prepaid in U.S. Funds. Please note that foreign checks have been taking about eight weeks for collection, so we would advise wirring money or checks drawn on a bank account in the U.S. Our bank is the Continental Illinois National Bank of Chicago, Account #73-32033. Visa or Master Charge also accepted.

ADD \$5.00 HANDLING ON ORDERS UNDER \$200.00

GIMIX® and GHOST® are Registered Trademarks of GIMIX INC.

## for the 50 PIN BUS:

GMXBUG 09 includes advanced debugging tools, utility, and memory manipulation

#### Both 6809 Systems:

- system monitors (OS-9 and SBUG-E)
- monitors.

2MHz 6809's at slight additional cost when they



1337 WEST 37th PLACE, CHICAGO, IL 60609 (312) 927-5510 • TWX 910-221-4055



# The Businessman's Business System

MSI Business Computer Systems offer flexibility and expandability unmatched by any other microcomputer system, large or small. Our SDOS operating system is totally device independent and supports up to four users. This means that you can start with a single user, dual drive, floppy disk system today, and add up to 80 megabytes of hard disk with additional workstations tomorrow. As your business grows, your MSI system grows with you—and your software won't become obsolete.

Perform text processing tasks at one workstation while entering sales orders on another. Add a third workstation in inventory control and a fourth in accounting. That's expandability!!!

- MSI Inventory Software, with complete Bills of Material, provides a complete inventory control and management system for manufacturers.
- Complete manufacturing forecasting, with production pick lists, allows automatic adjustment of component inventory levels.
- All transactions resulting in any change to the inventory data base are written to audit trail files listing date,

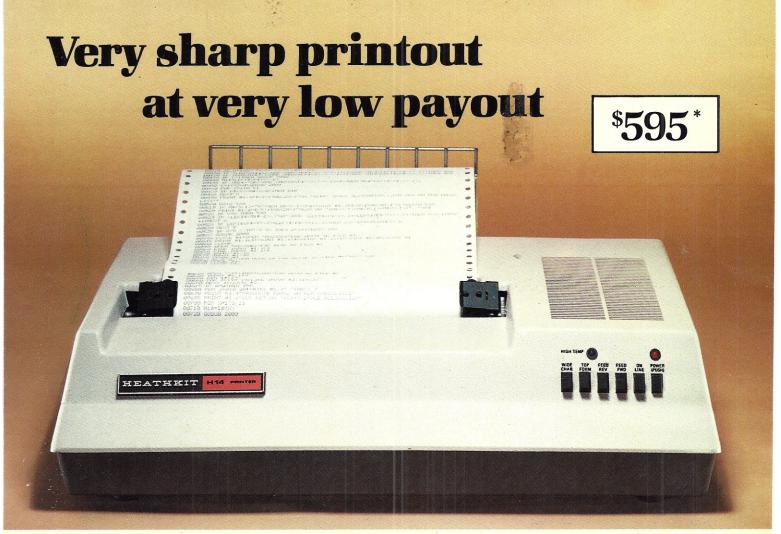
time, operator's name, inventory item, and the changes which were made.

- Sales Order Entry/Accounts Receivable Software displays customer balances and credit standing as new orders are entered. Correct product prices and descriptions are obtained from inventory files if desired.
- Invoices are generated automatically as orders are shipped. Customer statements, with aged accounts receivable, are printed on demand.
- Purchase Order Entry/Accounts Payable Software optionally link to inventory program, in order to easily visualize inventory items which are on order.
- General Ledger programs link to the accounts receivable and accounts payable modules for easy updates and posting.
- If your business is expanding and you would like to know how an MSI Computer System can help you make it more profitable, call or write Midwest Scientific Instruments, 220 W. Cedar, Olathe, Kansas 66061, (913) 764-3273, TWX 910 749 6403 (MSI OLAT), TELEX 42525 (MSI A OLAT).



Small Computers For Big Jobs

Midwest Scientific Instruments



## The Heath H-14 Printer gives you high-performance features at one of the lowest prices anywhere...

- 5 x 7 dot matrix and high quality impact printhead give you clear, easy-to-read images
- Standard 96-character ASCII set, UPPER and lower case
- Operator or software-selectable line widths; 132, 96, or 80 characters
- Compatibility with any computer having RS-232C or 20 mA current loop serial interface, with handshaking
- Sprocket paper feed, with adjustable spacing, to keep paper moving smoothly
- Sustainable print speed approximately 30 characters per second
- "Paper jammed" and "paper out" signals to prevent loss of data
- Selectable baud rates from 110 to 4800
- Convenience of standard fan-fold paper, 2.5 to 9.5 inches wide
- Chrome wire rack to keep paper neat

#### Visit your Heathkit Service Center

H-14 Printers are on display at the 61 Heathkit Electronic Centers throughout the U.S. and Canada. See your telephone white pages for the location nearest you.

In the U.S. Heathkit Electronic Cenfers are units of Veritechnology Electronics Corporation.

\*In kit form, FOB Benton Harbor, MI. Also available completely assembled at \$895.00, FOB Benton Harbor. Prices subject to change without notice. The H-14's remarkable price includes connecting cables, paper rack, paper, and ribbon — so you're all ready to run. And service for the H-14 is available at 61 Heathkit Electronic Centers in the U.S. or Canada.

Check out the microprocessor-based H-14 Printer today, in kit form or factory assembled. You'll find complete details in the newest, FREE Heathkit Catalog. Send for yours today, or pick one up at the nearest Heathkit Electronic Center. **Dealer inquiries on assembled units are invited, too.** 

Complete service, so you're never left out in the cold





Write to: Heath Company, Dept. 351-704. Benton Harbor, MI 49022

